

CIRCULATING COPY

Please Return Promptly

First Looks: How
Fast Are the First
Pentium Machines?
Find Out Here!

In-Depth Preview:
Will **Windows NT**
Convince You to
Dump DOS?

MAGAZINE

**NEW PLATFORMS
TO CHANGE THE WAY
YOU WORK...**

Pentium
Sun SPARCstation
PowerPC
DEC Alpha
Silicon Graphics
Indigo

THE New PCs

**...NEW OPERATING SYSTEMS
TO MAKE IT EASIER...**

Windows NT
OS/2 2.1
UnixWare
NeXTStep

**...AND GROUPWARE
TO MAKE IT HAPPEN**



It's All

BE

**in your
face**

ALL day Every DAY

CIRCLE 157 ON READER SERVICE CARD



Ferguson and Bardell, Outfitters Monthly Sales Projections.

SUMMER PRODUCT LINE

Ferguson and Bardell, Outfitters is projecting increased sales volume based on the introduction of our new line. A complete line of graphite rods, reels, sportsman's pocketed vests, durable waders, Vermont wicker creels, stringers, gourmet salmon eggs, and hand-tied flies will be available at retail this spring. Attention to detail and quality should place F and B fly fishing equipment at the top of every angler's list. Western region projections for the new line are included here. Samples of the new fly fishing line will be available at the upcoming Western sales conference in Coeur d'Alene next month. Another F and B favorite, our classic hexagonal nylon tent, has been redesigned to be more colorful than ever. Plan to review both of these exciting new product lines. The complete Ferguson and Bardell, Outfitters catalogue will be available to you at the conference, as well.

EQUIPMENT SALES PROJECTIONS



APPAREL

SIZE	QUANTITY	COLORS	PRICE
S,M,L,XL	40,000	Khaki, Olive	27
8-14	65,000	Khaki, Blue	30
S,M,L,XL	45,000	Olive, Yellow	89
S,M,L	60,000	Khaki, Bark	35

Available for inspection at the upcoming Western region sales conference in Coeur d'Alene next month. The new fly fishing line and the newly designed, colorful nylon tent line as well.



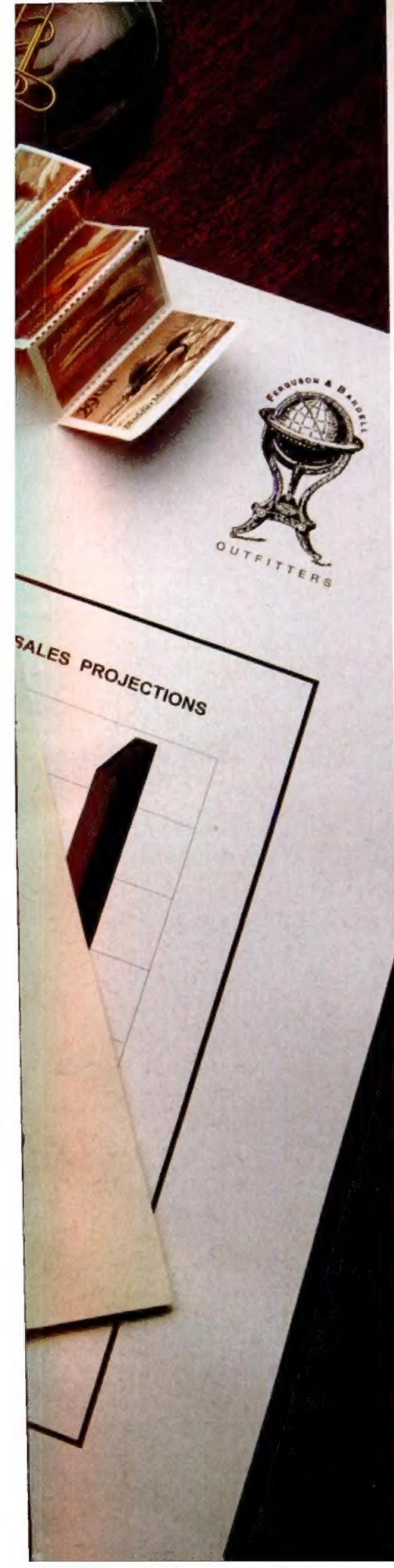
Dear Mr. Bentz

It is with great pleasure to include your conversation order, the

Wickets (3,000)

Also, and for

S



WORDSMITHS AND NUMBER CRUNCHERS UNITE.

Suppose you're putting together the monthly report. Gulp. You're going to write it, and include enough solid data to make the numbers guys jealous.

If you're fortunate enough to have The Microsoft® Office for Windows™, this is not a problem.

Because you can easily turn numbers into charts and graphs with Microsoft Excel. Then cut and paste them into your Word document. All kinds of text, data and graphics can be shared between applications. And you won't lose the formatting.

You can go on to make the report presentable at the status meeting or the big client meeting with PowerPoint® presentation graphics.

And once you're familiar with one program, you'll know them all. Even the first time, things will look comfortably the same. (What's wrong with a little instant gratification?)

So now you can focus on your job, and maybe discover talents you never knew you had. But first, you need more information. Call us at (800) 323-3577, Dept. KA2.

Who knows? It could be the first time you actually enjoy doing more than one thing at a time.



The Microsoft Office for Windows includes the complete editions of Microsoft Excel, Word, PowerPoint and a Microsoft Mail workstation license.

Microsoft
Making it easier

A NEW WAY TO ACCESS CORPORATE DATA

Now PC users can get their hands on corporate data, without burdening the MIS department, or tying into the central database. Introducing Monarch™, a unique PC application that uses *existing computer reports* as a source for data. Monarch extracts data from report files downloaded from any mainframe, mini or PC. Instantly, the reports come alive on your screen, so you can look things up, boil things down, get totals and subtotals, all at electronic speed. You can even send formatted data to applications like dBASE and 1-2-3. Call for a free demo disk!

1-800-445-3311

personics
A DATAWATCH COMPANY

234 Ballardvale St., Wilmington, MA 01887
508-658-0040 FAX: 508-988-0105

CALL FOR
FREE
DEMO

P10

Inside

Tired of that same old PC? Then "The New PCs", our cover story, is what you've been waiting for. The package of stories in this issue reports our scrutiny of the new hardware plat-

forms and the new operating systems that are going to challenge the Intel/MS-DOS alliance that has dominated the PC market for more than a decade.

This year will probably be remembered for its serious outbreak of computing contenders. New desktop machines from Apple, DEC, HP, IBM, Silicon Graphics, and Sun go up against a machine based on Intel's new

reviewers remarkably frank about the shortcomings of Ye Olde PC when compared with these new machines. Remembering that there are platform zealots as well as operating system fanatics, our new Graphics Hardware associate editor, Michael Neubarth, did a thorough job of sorting through the rivalries and prejudices to pull together a series of thoughtful, balanced articles.

Hardware without software is just a lot of plastic and metal. That's why we have also focused on the 32-bit PC operating systems: IBM's OS/2 2.1, Microsoft's Windows NT, and seven 32-bit GUI versions of Unix.



Pentium microprocessor. After years as a near-monopoly, DOS is suddenly put to the test by new or improved 32-bit operating systems from IBM, various Unix vendors, and even Microsoft itself, under the guise of Windows NT.

Our second annual Platforms issue also compares the strengths and weaknesses of the hardware products, focusing on what each does well. Understandably, some will accuse us of being too PC-centric, but we think you'll find our

Both IBM's and Microsoft's entry were in late beta stage when we looked at them, as were SunSoft's Solaris and NeXT's NeXTStep, two of the Unix versions for the Intel platform. We could not deliver final performance results for some new products, but we will run performance tests on them when we get final shrink-wrapped versions, and we will report the results to you. Meanwhile, read here about your next dream machine.—Joel Dreyfuss

PC Magazine: The Independent Guide to Personal Computing. ISSN #0888-8507 is published biweekly except in July and August for \$44.97 for one year. Ziff-Davis Publishing Co., a division of Ziff Communications Co., One Park Ave., New York, NY 10016. Second-class postage paid at New York, NY 10016 and at additional mailing offices. POSTMASTER: Address changes to PC Magazine, P.O. Box 54093, Boulder, CO 80321-4093. GST Registration Number: R-123669673.

Some People Are Born Accountants. For The Rest Of Us, There's New ACCPAC Simply Accounting For Windows.

Call 1-800-CALL CAI Today
For Your Free Demo Disk.

Easy To Learn, Easy
To Use And Only \$199



Now there's an accounting program anybody can use—new ACCPAC® Simply Accounting™ For Windows™



the quickest and easiest way to take care of your books.

You'll have it up and running in minutes. And with the Windows interface, you can do anything with just a few clicks of the mouse. Write a check. Print out an invoice. Do your payroll. Manage your receivables.



What used to take hours now takes just minutes. So you can spend less time counting your money—and more time making it.

And since it costs only \$199, you can take care of your books without breaking the bank.

Call us today at 1-800-CALL CAI for the location of your nearest dealer.

It's the accounting program anybody can use.

And we mean anybody.

COMPUTER ASSOCIATES
Software superior by design.



CA's Computing Architecture For The 90s.

For Only \$199 You'll Get: • General Ledger • Accounts Payable • Accounts Receivable • Payroll • Inventory Control • Job Costing • Prints Checks, Statements, Invoices and Mailing Labels • Produces Standard Accounting Reports • Quick Set-Up

© Computer Associates International, Inc., One Computer Associates Plaza, Islandia, NY 11788-7000. All product names referenced herein are trademarks of their respective companies.

CIRCLE 348 ON READER SERVICE CARD

NEW FOR WINDOWS!

Borland Office
for Windows

Get 3 complete Windows products for 1 low price!

Limited-time offer.
Special upgrade price!
\$299.95 U.S.
Incredible value of **\$1,785**

PARADOX
WordPerfect
QUATTRO PRO

Power made easy

WordPerfect
for Windows
NEW VERSION

Borland Paradox
for Windows
Relational database power made easy

Borland Quattro Pro
for Windows
Best Windows spreadsheet

Includes great business graphics!

Best Word Processor **Best Database** **Best Spreadsheet**

1993
BYTE
READERS
CHOICE
AWARD

WordPerfect for
Windows 5.2
June, 1992

PC
MAGAZINE
EDITORS'
CHOICE

Paradox for
Windows 1.0
May 11, 1993



Quattro Pro
for Windows 1.0
April 26, 1993

The steal of the century!

An unbeatable value

Introducing the Borland® Office for Windows—an unbelievable deal on the three best Windows programs, *all in one package!* If you own any Windows or DOS word processor, spreadsheet, or database, Borland and WordPerfect are working together to bring you a deal you can't miss.

WordPerfect®, the world's most popular word processor and winner of *BYTE's* Readers' Choice

Award; Quattro® Pro for Windows, the spreadsheet that just won *InfoWorld's* Product of the Year Award; and Paradox® for Windows, the easiest-to-use relational database, and winner of *PC Magazine's* Editors' Choice Award. If you could put together your own office of Windows software products, this would be it.

The three top products for the price of one. This is more than a deal—this is the steal of the century!

Limited-time offer.
Special upgrade price \$299.95

90-day, money-back guarantee!

See your dealer or call now,
1-800-336-6464, ext. 6628

In Canada call, 1-800-461-3327.

Borland
Power made easy

Special introductory price is \$299.95 for first-time buyers. Copyright © 1993 Borland International Inc. WordPerfect is a registered trademark of WordPerfect Corporation. Offer good in the United States and Canada only. All prices in U.S. dollars. Dealer prices may vary. BI 5655

CIRCLE 295 ON READER SERVICE CARD



UP FRONT

Inside

Platform face-off4

Letters

The "green PC" debate rages on19

Trends

- PC video getting better
- DOS, Windows in '94
- Color laser printers
- Business war games.....29

First Looks

- Five hot Pentium systems
- Windows NT applications
- Microsoft's New Mouse
- The Norton Utilities 7.0...37

New and Improved

BY BRAD GRIMES59

Read Only

EDITED BY CAROL LEVIN73

Toolkits

BY TRUDY NEUHAUS.....77

COLUMNISTS

Michael J. Miller

New PCs, New Ways of Working81

Bill Machrone

Getting Organized87

John C. Dvorak

BIOS, BIOS, Who's Got the BIOS?93

Inside Track95

Jim Seymour

PC Sound: Eight Isn't Enough99

Bill Howard

Laptop Buyers' Checklist105

COVER STORY

Computers

The New PCs

BY DON CRABB The distinctions between PCs, Macs, and workstations are rapidly blurring as Alpha, Pentium, the PowerPC, and Windows NT emerge. On the brink of this new PC/workstation era, we took a platform performance snapshot by testing a new Pentium-based PC versus four RISC/Unix workstations and a Macintosh Quadra 800109



Compaq Deskpro 5/66M Model 510	136
Apple Macintosh Quadra 800	138
HP Apollo 9000 Model 715/50	146
IBM RS/6000 PowerStation 635	152
Silicon Graphics Iris Indigo R4000 XZ	157

Sun Microsystems SPARCstation LX	160
Highlights	112
Suitability to Task	113
Preview: Alpha AXP PC	129
Performance Tests	132
CPU Comparison	144
PowerPC: A Look at the Future	166

Cover photograph by Christopher Gould

Operating Systems

Windows NT:
The Power Under the Hood

BY BEN EZZELL It looks like Windows 3.1 and feels like Windows 3.1, but Windows NT is a new and different animal—a full 32-bit operating system with a depth and breadth of features spanning networking, security, and fault tolerance. We preview NT to help you decide whether or not it's time for you to make your move173

The NT Development Arena.....	178
The NT Architecture	180
The Microsoft Family of Operating Systems.....	187
NT Tips and Troubleshooting	188

Operating Systems

OS/2 2.1: IBM's 32-Bit
Challenger Revisited

BY JOE SALEMI With Microsoft's Windows NT and a number of GUI-based Unix systems on the brink of release, the battle for PC power users is under way. IBM strikes back with this upgrade, which includes support for Windows 3.1 and drivers for a broader range of SCSI drives and video cards.....207

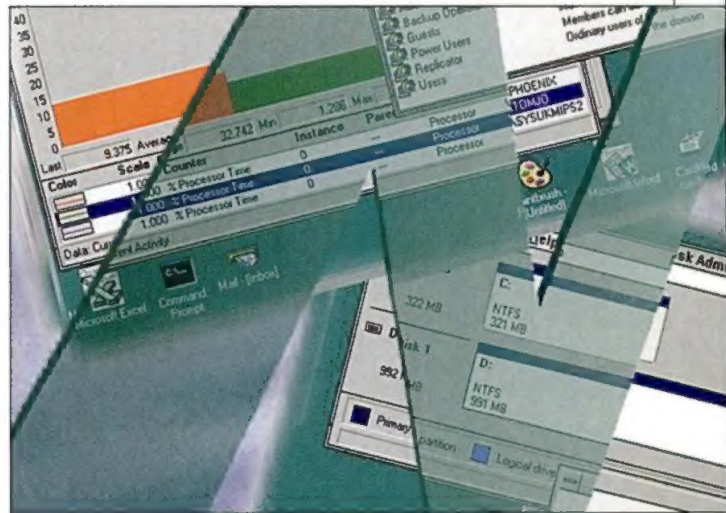
Highlights.....	208
Supporting OS/2: IBM Shatters Tradition	212

Operating Systems

Unix on Intel:
The Beast Turns Beauty

BY DAVID S. LINTHICUM AND STEVEN A. VAUGHN-NICHOLS Now that it speaks DOS and Windows and hides its powerful 32-bit operations beneath sophisticated, friendly GUIs, Unix finally stands a chance at cracking the mainstream marketplace. Can a united Unix head off NT?219

Consensus V 4.2.....	234	Highlights	220
Dell Unix System V Release 4	238	Editors' Choice	221
Interactive Unix	240	Suitability to Task.....	222
SCO Open Desktop, Version 2.0.....	250	Unix's Non-Intel Heritage.....	224
UnixWare.....	253	Performance Tests.....	232
		The NeXTStep Generation.....	238
		Solaris 2.1: The Rise of a New Sun?.....	244



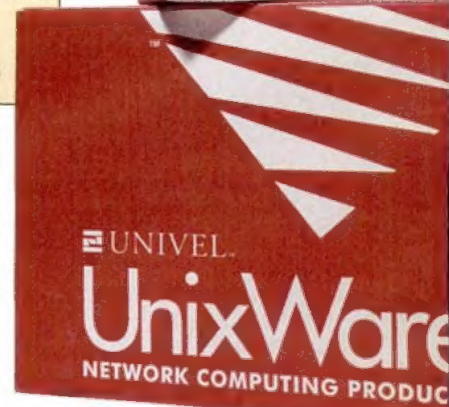
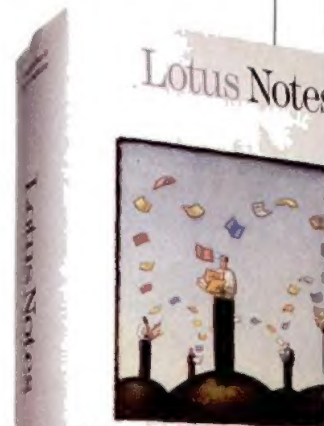
Software

Best of a New Breed:
Groupware—Are We Ready?

BY TED STEVENSON Groupware. Everybody wants it, though no one's quite sure what it is. But the allure of software that can supercharge your group process is powerful. This report looks at the leaders of the PC groupware pack267

BeyondMail for DOS, Release 1.1	270
BeyondMail for Windows, Release 1.0	270
CM/I, Version 1.0.....	276
Keyfile 2.0.....	285
Lotus Notes, Release 2.1A	287
Office.IQ.....	291
Futurus Team DOS/Windows Combo	297

Suitability to Task.....	269
Which Group(ware) Are You?.....	278
Building the Perfect Office	290
Open Windows for Workgroups	292
Digital's TeamLinks: A Real Team Player for the VAX Office.....	296



TECHNICAL COLUMNS

User-to-User



BY NEIL J. RUBENKING An improved version of VCOPY.BAT, which lets you copy volume names among floppy disks; print out a help reference for all of DOS's commands300

Tutor

BY JEFF PROSISE Deleting and Undeleting Files from Your Disk307

Lab Notes



BY DANNY THORPE Creating Hidden Credit Screens in Windows Programs313

Utilities



BY PHILIP J. ESKELIN, JR. Bring Your Desktop to Life with ICON ANIMATOR335

Environments



BY CHARLES PETZOLD OS/2 Paths and Fonts: The Versatile Connection347

Power Programming

BY RAY DUNCAN Four Techniques to Enhance Your Windows Help Files359

A new era dawns in operating systems and network-specific applications: IBM's OS/2 2.1 beta (far left) installs from a CD-ROM; Windows NT (above) is Microsoft's bid in the race for a new operating system standard; Univel's Unixware (left) tries to prove that Unix can have mass appeal; Lotus Notes remains a pacesetter in groupware.

Photographs of CD and software by Thom O'Connor

Solutions

PCs

Memory parity errors that appear when you run Windows.....364

Peripherals

Why some monitors show a faint gray line running across the screen; how to get stuck labels out of your printer; what you should know about horizontal and vertical scan rates when choosing a monitor364

Operating Environments



If the phrase "Bad command or file name" appears on your screen during boot-up, here's why; how to force your Windows swap file to the end of the disk369

Word Processing

Yet another way to load template files in WordPerfect without overwriting the original; a shortcut for adding new rows and columns to WinWord tables.....371

Spreadsheets



An Excel macro that lets you open a file and close the one that you were working on, all in one action373

Databases



How to set up your FoxPro environment for debugging.....374

Graphics

Creating masked objects in Adobe Illustrator.....382

Networking

Speeding up large print jobs over a LAN; how to reduce microwave interference on a 10BaseT network385

Languages



Three BASIC routines that let you find files and read or modify their attributes385

AFTER WORDS

After Hours

Science Software: From Anatomy to Zoology, Scientific Method Meets the PC

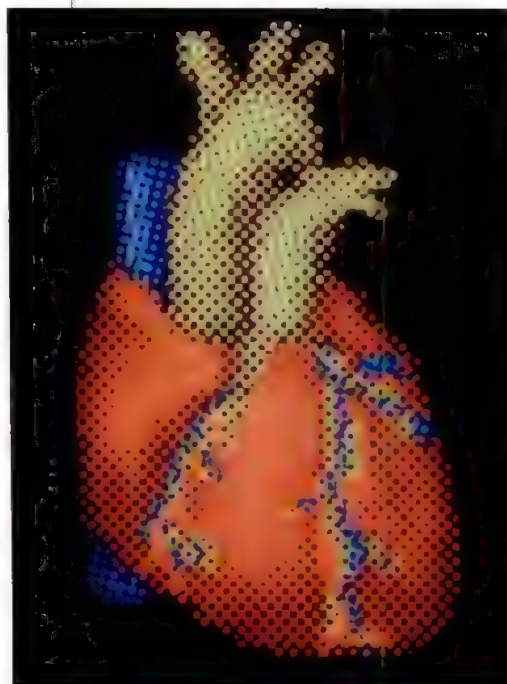
- Body Illustrated
- Operation: Frog
- Quarky & Quaysoo's Turbo Science
- Chemistry Works.....466

Abort, Retry, Fail?

BY ROBIN RASKIN470

ALSO IN THIS ISSUE

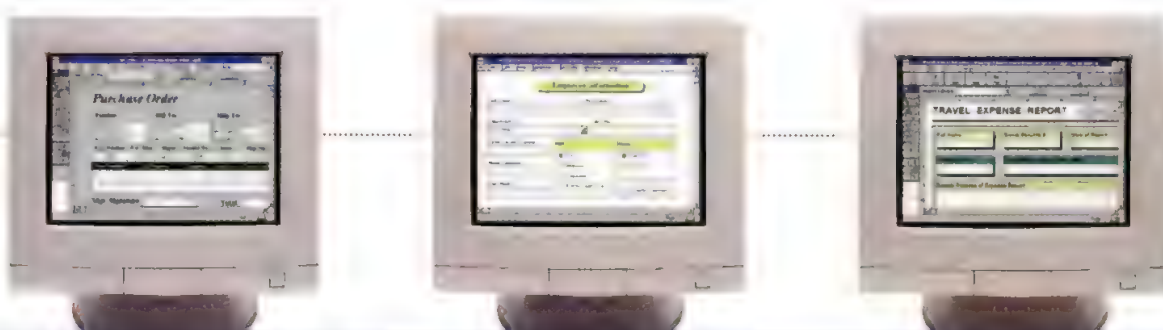
Direct Marketing Connection	363
Marketplace	429
Classified	429
Premier	429
Business Cards	452
Reader Service Card	453
Index to Advertisers.....	461
Advertisers' Product Index	462
Coming Up	464
Editorial Product Index	465



Take a fantastic voyage inside the human body with Body Illustrated (page 466).



THESE FORMS HAVE BEEN DESIGNED, REVISED, THEY HAVE, HOWEVER,



INTRODUCING WORDPERFECT® INFORMS. Welcome to the first software package that can take most of the work — and all of the paper — out of routine office paperwork. With WordPerfect® InForms, any business form your company needs can be created, distributed and filled in electronically, and the information can be written directly to your database. So you'll never have to lay a finger on another invoice, timesheet, purchase order or employee record again. ■ The WordPerfect InForms Designer program (available for Windows) lets you quickly create the electronic equivalent of any paper form you're using now (complete with logos, if you like) for distribution by e-mail

ED, MAILED, FILLED IN, SIGNED, AND FILED.
NEVER BEEN TOUCHED.



to anyone in your organization. The Filler program (available now for Windows, and soon for other platforms) then makes short work of filling in the blanks — and even signing your documents — electronically. WordPerfect InForms supports desktop databases such as dBase, Paradox, FoxPro and DataPerfect® as well as SQL databases like Oracle and Sybase, and it can act as a powerful front-end to any of them. So WordPerfect InForms is not just the end of paperwork as you've known it. It's a better way of managing and sharing business information.

For more information or a free demonstration disk, call WordPerfect at (800) 526-0490.



WordPerfect



Editor-in-Chief Michael J. Miller

Editor Joel Dreyfuss

Executive Editors Bill Howard, Robin Raskin

Director, PC Labs C. James Galley III

Art Director David Herbick

Senior Networking Editor Frank J. Derfler, Jr.

Senior Editors Christopher Barr (West Coast), David Greenfield (Networking and Communications), Trudy Neuhaus (Technical Columns), Don Willmott (First Looks)

Managing Editor Paul B. Ross

Assistant Managing Editor Dianne H. McDonald

Manager, Copy Edit Karen A. Carter Associate Editors Julie Cohen (After Hours), Gayle C. Ehrenman (Graphics), Mary Kathleen Flynn (Trends), Brian Nadel (PCs), Michael Neubarth (Graphics Hardware), Ted Stevenson (Software), Sharon Terdeman (Technical Columns), Jennifer Zaino (Hardware) Technical Editor Neil J. Rubenking Production Editors Shari L. Girouard, Kim Schueler Copy Chief Glen Boisseau Becker Staff Editors Jamie M. Bsates, Angela Gunn, Catherine Kunkemueller, Carol Levin, John Moore, Michael W. Muchmore, Ann Ovodow, Craig L. Stark, Emerson A. Torgan, Lance N. Ulanoff Senior Writer Robert S. Anthony Staff Writer Oliver Rist Copy Editors Jeanne Albrecht, Robin B. Bornstein, Elisabeth H. Holzer, Kimberly Lee, Jill Léger, Bob Sillery Assistant Copy Editor N. Jeanne Smith Assistant Editors Brad Grimes, Ellyn McCasland Layout Manager Linda Harms Assistant Layout Manager Shelly Fierston Senior Layout Editors Thomas DeVito, Lillian Gaffney Layout Editor Michael L. Graham Librarian Thomas W. Giebel Library Assistant Dolores Williams Editorial Researchers Tin Albano, Daniel A. Begun, Angela Hickman, Adam A. Hicks, Andrew C. Kantor, Brad Stilwell, Anush Yegyzarian Editorial Assistant Melissa J. Perenson Business Manager Justine Casey Gaeta System Support Manager Craig Ellison PC Support Analyst Melvin Acevedo Production System Support Manager Pat Perkowski Communications Manager Allison Playford Assistant to the Editor-in-Chief Tara Hoffinger Assistant to the Editor Rita Aprahamian Assistant to the Executive Editors Christina M. Evelyn Administrative Assistant Christina Okang Support Associate, PC MagNet Louise Laberge Sysop, PC MagNet Ken Hipple

Contributing Editors Bill Machrone (Publishing Director), Douglas Boling, Bruce Brown, Ray Duncan, John C. Dvorak, Mitt Jones, Michael J. Mefford, Edward Mendelson, Bill O'Brien, Charles Petzold, Alfred Poor, Jeff Prossie, Sal Ricciardi, Winn L. Rosch, Joe Salemi, Jim Seymour, Richard Hale Shaw, Barry Simon, Luisa Simone, Craig Stinson, M. David Stone, Ethan Winer

Associate Art Directors Heidi Antman, Charles Conover, Donna Panagakos, Lisa A. Sergi Assistant Graphics Director David Foster Graphic Artists Robin L. Malik, Josef Pusedu Assistant to the Art Director Frieda T. Smallwood

Technical Directors Rick Ayre (Software), Nick Stam (Hardware) Project Leaders Richard Brady (Networking and Communications), Ben Z. Gottesman (Software), Jonathan Hill (Graphics Hardware), Jeff Mace (Graphics), Stephen W. Plain (Applications Development), Michael J. Zulich (Hardware) Senior Programmer Stuart R. Greenberg Programmer Richard V. Dragan Product Testing Manager Charles Rodriguez Technical Analysts Mario Baldasserini, Jimmy Beltran, Richard Fisco, Margaret A. Piemonte, Amarendra Singh Support Technicians Thomas M. Amoroso, Paul Y. Chin, Corey A. Cooley, Laura Cox, William P. Flanagan, Constantine Fotopoulos, Dan Smith Operations Manager John R. Delaney Inventory Control Coordinators Peter Bastide, Rob Graydon, John Jones Administrative Assistant Angela M. Collins

Publisher Jeff Ballowe

Associate Publishers Anna Zornosa (West Coast), Daniel Rosensweig, Michael Perkowski (Marketing) Advertising Director, East Coast Lon Otremba Promotion Manager Stacy O'Connell Publishing Services Manager Bill Stephen Client Services Managers Mark Malloy (Direct Marketing), Michael Wiener (Networking), Steve Robinson (Systems) Creative Services Manager John Wisdom Research Director Michael Van Engen Research Associate Theresa McKenty Special Projects Director Karla Spormann Assistant Events Manager Dawn Gudelis

Senior Advertising Production Manager Lori Iaccino Advertising Production Manager Pamela Berkowitz Assistant Advertising Production Managers Susan Conrad, Allen Grady Editorial Production Coordinators Kevin S. Fagan, Jo-Ann Hirschel

Advertising Office: One Park Ave., New York, NY 10016-5802; 800 33 MAG AD, 212-503-5100

Ziff-Davis Publishing Company

Chairman and CEO Eric Hippeau

President J. Scott Briggs

Executive Vice Presidents Ronni Sonnenberg, Mike Edelhart

Executive Vice President, International J.B. Holston III

Group Vice President J. Samuel Huey

Group Vice President, Direct Publications Jim Stafford

Senior Vice President, Marketing Paul H. Chook

Senior Vice President Rachel Greenfield

Vice President & General Manager Louis B. Dotti, Jr.

Vice Presidents Baird Davis (Operations), Howard D. Skolnik (Controller), Herbert Stern (Creative Services), Rolf Wulfsberg (Research), James F. Ramaley (Circulation Services), Ann Pollak Adelman (Marketing Services), Roger Herrmann (Production), Frank Kelcz (Europe), William B. Machrone (Technology), Paul Stafford (Central Advertising Sales), Marian O. White (ZD Magazine Networks), Rayna Brown (Human Resources), Claude P. Sheer Assistant to the Chairman Tom McGrade Executive Director, Information Systems John Helliwell National Managing Director, Magazine Networks Joseph Gillespie Directors Jean Lamensdorf (Licensing), Gary A. Gustafson (Planning), Walter J. Terlecki (Production), Dan Leonetti (Sales Training), Susan Delman (Corporate Marketing), Lewis D'Vorkin (Editorial Director), Bill Catchings (Co-Director ZD Benchmark Operations), Mark L. Van Name (Co-Director ZD Benchmark Operations), Alicia Marie Ivans (Direct Marketing Programs), Gregory M. Jarboe (Public Relations)

Ziff Communications Company

Chairman William B. Ziff, Jr.

President Philip B. Korsant

Executive Vice President Philip Sine

Senior Vice President Steven C. Feinman

Vice President & Special Assistant to the Chairman Bruce Barnes

Vice President, General Counsel, and Secretary J. Malcolm Morris

Vice President, Controller, and Treasurer Patrick J. Burke, Jr.

Vice President Seth R. Alpert

Vice President, Business Manager T.L. Thompson

Vice President, Chief Information Officer Thor Olson

Vice President, Electronic Editorial Director Michael Kolowich

Subscription Inquiries, Address Changes

Subscription Services: For subscription service questions, address changes, or ordering information, call toll-free 800-289-0429 in the U.S. and Canada; all other countries, please contact Ireland: 353-61411466 or fax 353-61419457. Or write to *PC Magazine*, P.O. Box 54093, Boulder, CO 80322-4093.

Subscription Rate: The subscription rate is \$44.97 for a one-year subscription (22 issues). Canada and all other countries, please add an additional \$36.00 for postage.

Back Issues: For back issues (subject to availability), \$8 per issue (\$9 outside the U.S.), send check or money order to Back Issues Dept., Ziff-Davis Publishing Company, P.O. Box 53131, Boulder, CO 80322-3131.

How to Contact the Editors

We welcome letters. However, we cannot look up stories from past issues, recommend products, or diagnose problems with your PC by phone. Send your written questions, complaints, and compliments to *PC Magazine*, One Park Avenue, New York, NY 10016-5802. Please include a daytime telephone number. Send electronic mail to MCI Mailbox 157-9301, CompuServe address 72241.104 or to PC MagNet (see below). *PC Magazine's* general number is 212-503-5255. The West Coast Operations number is 415-378-5500.

If you are dissatisfied with a product advertised in *PC Magazine* and cannot resolve the problem with the vendor, write (do not call) Julie Eigo, Advertising Department, at the above address. Include copies of your correspondence with the vendor.

PC Magazine does not accept unsolicited manuscripts. We will pay \$50 for Solutions and Programming user tips and for Abort, Retry, Fail? submissions. If you submit artwork or newspaper clippings with Abort, Retry, Fail?, mark up the photocopy, not the original.

PC MagNet

PC Magazine operates PC MagNet, an on-line service of ZiffNet, hosted by CompuServe. To join, set your communications software for 300, 1,200, 2,400, or 9,600 bits per second (bps), 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest you, dial 800-346-3247. (In Canada, dial 800-635-6225, voice only.) When the modem connects, press Enter. At the Host Name prompt, enter PHONES. Follow the menus, note the number closest to you, then hang up and dial the number you have just found.



To obtain the utility without ZiffNet connect charges, at the HOST NAME prompt, enter CIS. At the USER ID prompt, enter 60116.1. At the PASSWORD prompt, enter PCMAGUTIL. To join ZiffNet, at the Host Name prompt, enter CIS. At the USER ID prompt, enter 177000.5000. Enter PC* MAGNET at the PASSWORD prompt and Z11D9200 at the ENTER AGREEMENT NUMBER prompt. CompuServe members may join by typing GO PCMAG at any CIS prompt. For Customer Service, call 800-848-8990. ZiffNet membership is \$2.50 a month, which includes access to *PC Magazine* Editors' Choice Awards, Product Reviews Index, weekly news from PC Week, Buyers' Market, and ZiffNet Highlights and Information. Hourly connect charges are \$6.30 for 300 bps, \$12.80 for 1,200 or 2,400 bps, or \$22.80 for 9,600 bps.

Permissions, Reprints

Material in this publication may not be reproduced in any form without permission. If you want to quote from an article or use *PC Magazine's* logo in conjunction with an Editors' Choice designation, write Chantal Lavelanet; for information on reprints in quantities of 500 or more, write Carol Peters.

PC Magazine Reviews

Except where noted: All *PC Magazine* reviews are of currently available products. Benchmark and performance tests are run on Compaq Deskpro 386/25s and 25e's.

Editorial and Business Office: One Park Ave., New York, NY 10016-5802. Editorial: 212-503-5255; Advertising: 800 33 MAG AD, 212-503-5100. *PC Magazine* is an independent journal, not affiliated in any way with International Business Machines Corp. IBM is a registered trademark of International Business Machines Corp. Entire contents copyright ©1993 Ziff-Davis Publishing Company, a division of Ziff Communications Company. All rights reserved; reproduction in whole or in part without permission is prohibited. The following are registered trademarks of Ziff Communications Company: PC, *PC Magazine*, PC Labs, PC MagNet, PC Magazine Award for Technical Excellence, PC Magazine Editors' Choice Award. The following are trademarks of Ziff Communications Company: Abort, Retry, Fail?; Connectivity; Databases; Direct Marketing Connection; First Looks; New and Improved; Advisor; Lab Notes; PC Marketplace; Pipeline; Trends; Tutor; The PC Utilities; Power Programming; Power User; Read Only; Spreadsheets; User-to-User; The Working Word

PRINTED IN THE U.S.A.



Project Scheduler 5™

**Multi-platform flexibility.
Multi-project management power.
Unheard-of simplicity.**



Booth #4140



SEE US AT
PC EXPO IN NEW YORK
JUNE 29, 30 AND JULY 1, 1993
JACOB K. JAVITS
CONVENTION CENTER
NEW YORK CITY

As a project manager, you know the problems of managing and coordinating several projects at once: tight schedules, limited resources, different computing platforms.

What's the solution? Award-winning Project Scheduler 5. Fast, informative, and fun, Project Scheduler 5 is known around the world for its powerful yet simple graphical interface—and its unmatched ability to make multi-project management easier and more efficient than you ever thought possible.

DOS, Macintosh, and OS/2 compatible.

Unlike Microsoft, we recognize that today's businesses operate in a multi-platform computing environment. That's why Project Scheduler 5 is the only project management software available in DOS, Macintosh, and OS/2 versions for seamless multi-project management throughout your organization.

Multi-project management with ease. With Project Scheduler 5 you can track resources and status across multiple projects. Integrate multiple projects into groups and establish dependencies that cross project boundaries. Automatically calculate validated group

schedules using error-free, cross-project critical path analysis. And automatically update individual projects to accommodate schedule commitments and changes made at the group level.

A professional product. Backed by professional support.

When you have a question, we'll get you the answer fast—without making you waste your time waiting in an electronic queue. Our support program even provides direct access to Project Scheduler 5's designers. And we offer the most comprehensive training and consulting program in the industry.

The ideal corporate solution.

Whether you're managing multiple projects in a Fortune 500 corporation, or a single project in a small business, Project Scheduler 5 is the fast, easy, and elegant way to make everything come together—on time, every time.

For more information, call or write:

415/570-7700
393 Vintage Park Drive
Suite 140
Foster City, CA 94404

Scitor
Corporation

The Leader Of The Pack In Windows Comm Software.

Naturally, you'd expect *us* to say that Crosstalk® for Windows is the biggest, baddest comm software around. But the experts agree with us: For both ease-of-use and power, Crosstalk blows past the other Windows™ comm programs—including Procomm Plus® for Windows. So hop on, and let's hit the road.

Born To Communicate.

Ever since Crosstalk for Windows was introduced, it's been a top pick of reviewers everywhere.

“Crosstalk for Windows sets the performance bar even higher for competitors in the Windows communications market.”

—PC World, October 1992

But its newest release has really brought the raves rolling in.

PC World says Crosstalk for Windows 2.0 “advances the state of the art in modem software.” PC Today says our new interface is “extremely handsome, intuitive, and easy to use.” And PC Sources calls it “a compelling communications

product” that’s “as easy to use as a full featured communications software product can be.”

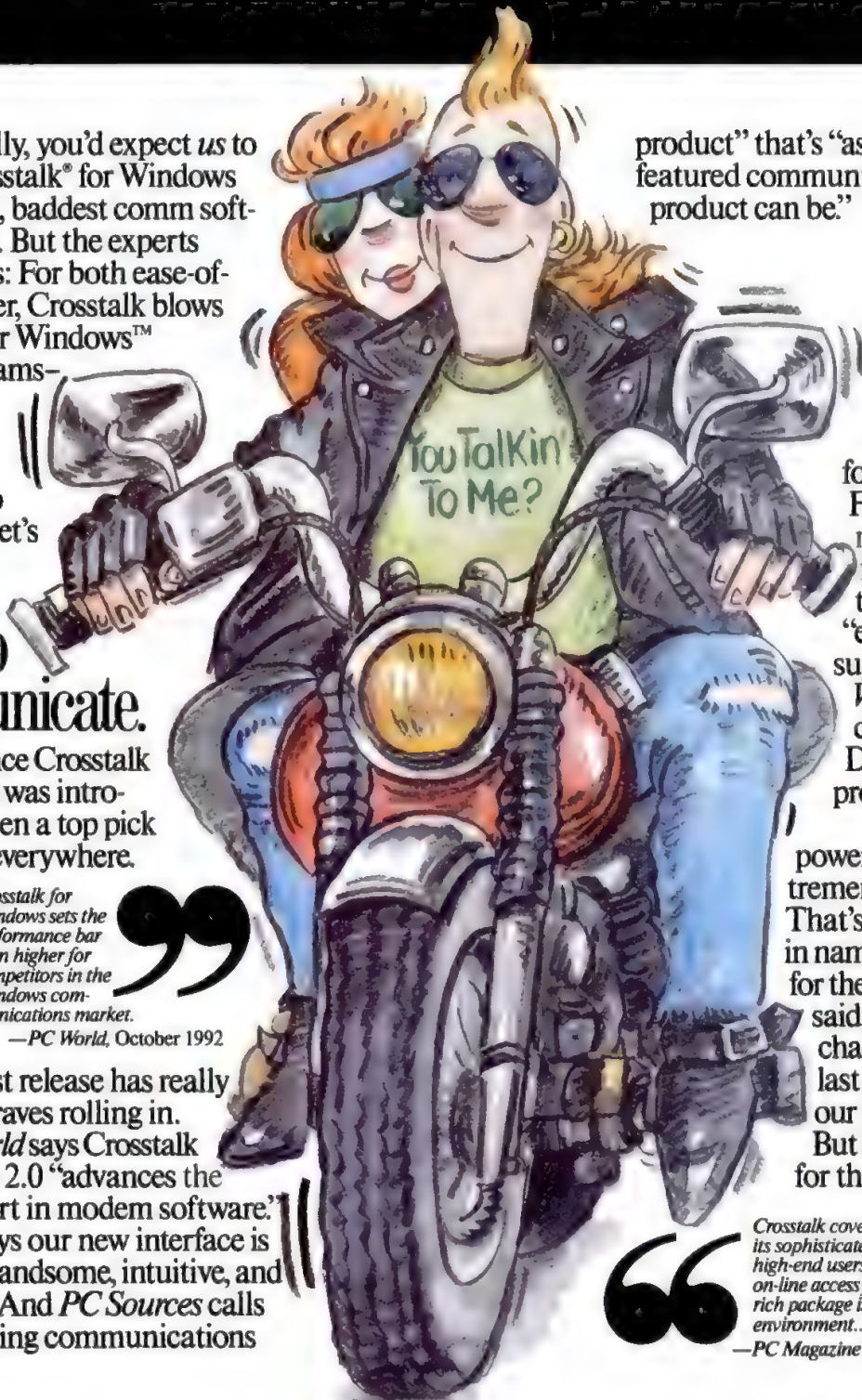
Easy-To-Use Rider.

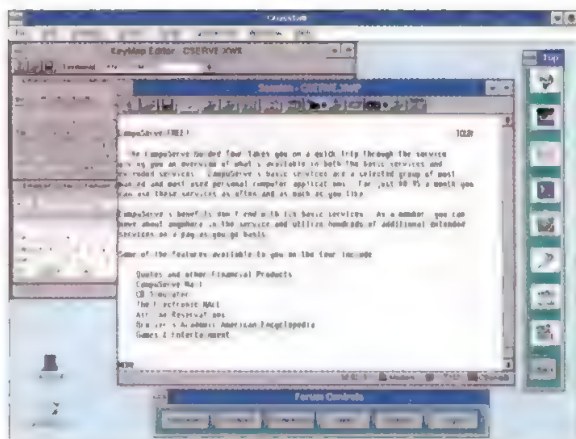
Crosstalk has always been known for its horsepower: Features like the terminal emulations and file transfer protocols that InfoWorld rated “excellent.” And the superior speed that Windows Sources called “as fast as any DOS communication program.”

But now all that power is combined with tremendous ease of use. That’s why PC Magazine, in naming us Editors’ Choice for the second year in a row, said, “This package has changed a great deal since last year, when it earned our Editors’ Choice Award. But it has changed only for the better.”

“Crosstalk covers all bases with its sophisticated scripting for high-end users and quick on-line access for novices. This rich package is suitable for any environment....”

—PC Magazine Editors’ Choice, April 1993





"Even with all the added interface pizzazz, Crosstalk keeps an air of clean, no-nonsense functionality, unlike Procomm for Windows, which offers enough glitz to be distracting."

—PC World, October 1992

Crosstalk Leaves The Competition In The Dust.



June 30, 1992
Crosstalk for Windows
Version 1.2.1

Fact is, if you're ready for a Windows comm program, there are two products you're most likely to consider:

Crosstalk for Windows and Procomm Plus for Windows. And reviewers have been

clear about their preference.

PC Magazine called our interface "elegantly designed" while noting that with Procomm Plus for Windows, "so many non-essential elements remain on-screen during terminal sessions." And Windows Sources commented that Crosstalk, "unlike Procomm for Windows, provides a full screen for sessions."

And when you have questions, here's what you'll find, according to InfoWorld: "DCA's technical support staff was very professional." They answered "with little or no delay and knew the

program thoroughly." On the other hand, they "tried to reach Datastorm technical support more than 30 times in two weeks. All we ever got was a busy signal."

InfoWorld summed it all up: "Crosstalk is stronger than Procomm for Windows." 'Nuff said.

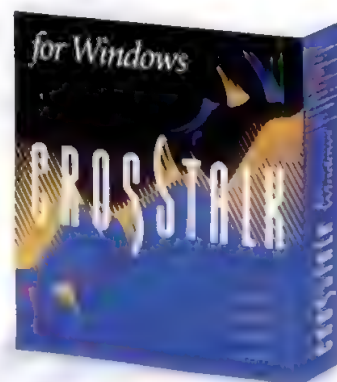
A Few Key Differences Between Them And Us	Crosstalk for Windows	Procomm Plus for Windows
Ease-of-Use Features		
Automatic Font Sizing	YES	NO
Multiple Sessions	YES	NO
Multiple Document Interface (MDI) Support	YES	NO
Built in Text Editor	YES	NO
Built-in Script Editor	YES	NO
Drag and Drop File Transfer	YES	NO
Drag-and-Drop Keyboard Remapping	YES	NO
Ready-to-Use Scripts for AT&T Mail, CompuServe, Delphi, Newsnet, Lexis/Nexis, OAG, VU/TEXT (Dialog)	YES	NO
Power Features		
HP 700/94 and 2392A Emulations	YES	NO
IND\$FILE File Transfer Protocol	YES	NO
Built-in NASI/NCSI LAN Support	YES	NO

Ride With The Leader.

We hope all this has gotten your engines revved up a bit. Through August 2, 1993, registered users of Procomm Plus or any Crosstalk product (including earlier versions of Crosstalk for Windows) can upgrade to Crosstalk for Windows 2.0 for only \$49, by calling our toll-free number.

Give it a try, and you'll fall for the leader of the pack. And yes, we are talkin' to you.

1-800-348-3221,
ext. 48A*

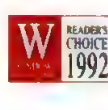


CROSTALK

Another Communications Solution From DCA®

SEE US AT SPRING COMDEX BOOTH #N6848.

*Offer expires August 2, 1993, and is available in U.S. and Canada only. Must show proof of ownership. Limit one per site. Allow 6-8 weeks for delivery. (404) 475-8380. ©1993 Digital Communications Associates, Inc. DCA and Crosstalk are registered trademarks of Digital Communications Associates, Inc. Windows is a trademark of Microsoft Corporation. All other trademarks are the property of their owners.



CIRCLE 061 ON READER SERVICE CARD

Announcing
LAN printers
smart enough to
connect to
your PCs, your
Macs, your
workstations, and
your future.

THE NEW IBM LASERPRINTER 4039



Five new LaserPrinters deliver 10, 12, or 16 pages per minute. And the smartest price/performance/connectivity package in the business.

It's one thing to build intelligent printers. It's another to build intelligent investments. The new IBM LaserPrinter 4039 family by Lexmark is both.

For starters, a single internal network card connects the new IBM LaserPrinters to multiple network operating systems, *simultaneously*. And the card's flash memory lets you download new operating systems or update current ones, without touching the printer. So your printer stays compatible. And your investment stays intact.

Lexmark's Ethernet and Token-Ring cards give you bi-directional communications, too—so LAN managers can troubleshoot their printers without leaving their desks.



Select a single network card, and you're connected to all these operating systems *simultaneously*.

Add a Lexmark AppleTalk card and IBM 4033 external LAN

adapter (Token-Ring or Ethernet) and you can configure any LaserPrinter for just about any mix of environments—or reconfigure just as easily. (Either way, Lexmark's network-savvy Quick Start installer makes setup a fast, one-step process.)

There are five new LaserPrinters, with 10, 12, or 16 pages per minute, and fast RISC processors to maximize throughput. And each model gives you all this flexibility and connectivity. So you don't



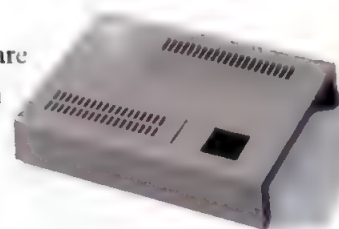
Two-sided printing is an option on every model, to save paper and filing space. And help save the environment.

have to buy a big, expensive printer to get multi-environment connectivity.

You get PostScript® and PCL5 compatibility, standard. Up to three simultaneously active ports. And built-in intelligence called SmartSwitch, to choose the right language and right port for each job, automatically.

600 dpi is standard. So is PictureGrade™ processing, for sharper images. Upgradable code lets you add new capabilities. And there's a host of paper-handling options, including a snap-on duplexer, for the lowest-priced two-sided desktop printing in the business.

The new LaserPrinters are the latest from Lexmark, an independent, worldwide company formed from a division of IBM with a very simple business plan. Listen to what customers want. Bring it to market fast. Back it with quality, support, and responsiveness.



The optional IBM 4033 LAN adapter eliminates a dedicated print server, and expands your connectivity.

For your nearest dealer, call 1 800 358-5835 (in Canada, 1 800 663-7662).

And see LAN printers intelligent enough to put you on the cutting edge today. And keep you there tomorrow.

IBM Personal Printers by

LEXMARK™

Make Your Mark

CIRCLE 024 ON READER SERVICE CARD

IBM is a registered trademark of International Business Machines Corporation in the U.S. and other countries and is used under license. AIX and OS/2 are registered trademarks of International Business Machines Corporation. PostScript is a registered trademark of Adobe Systems Incorporated. AppleTalk is a registered trademark of Apple Computer, Inc. Novell and NetWare are registered trademarks of Novell Inc. Microsoft is a registered trademark of Microsoft Corporation. Lexmark and PictureGrade are trademarks of Lexmark International, Inc. ©1993 Lexmark International, Inc.

FAMILY. BY LEXMARK. PRINT SMART.

Protection From Things You Can't Even See.

In Mr. Magoo's case, what he can't see covers lots of territory. For the rest of us, it includes things like invisible electronic emissions.

The more electronic equipment you work with, the greater the concern. That's why some monitor manufacturers offer models with VLMF (Very Low Magnetic Field) features. And charge extra for them.

But not Samtron. We were among the first to offer VLMF on our monitors. And now we build it into every advanced monitor.

For this, Samtron's extra charge is zero.

Another thing you won't see on these monitors is



flicker. That's because they're built with non-interlaced technology.

It's a difference even Magoo can appreciate. Take our new flat-screen 15" color monitor (SC-528DXL), for example. Together with a fine-grained 0.28 dot pitch and 1,024 x 768 high resolution, it gives you a picture that is not only steady, but crisp and clean.

The same can be said of our economical 14" color monitor (SC-428TXL).

Both are VGA and VESA compatible.

As we said, they all come with VLMF. Plus something else worth looking for.

The reliability of the Samtron name.



He needs all the help he can get.

Advantages
Anyone
Can See

SAMTRON

CIRCLE 296 ON READER SERVICE CARD

Samtron, 14251 E. Firestone Blvd., #101
La Mirada, CA 90638 (310) 802-8425
Canada (416) 858-3000
Mexico 011 525 325 0993

Letters

GREEN BASHING

PC Magazine and Bill Howard should resist such trends as "The Politically Correct PC" (March 30, 1993) with all their energy. The so-called environmental movement is dominated by Socialist and other leftist groups that can't get their programs adopted on their own merits. Computers have no place in the world they are planning for us. Bill Howard would do well to consider the fact that many of the physical and chemical processes that are fundamental to manufacturing PCs would be outlawed or rendered more expensive if the "Greens" prevailed in the current debate. In fact, *PC Magazine* would be politically incorrect and lose its audience, since PCs would no longer be a mass-market item.

James F. Glass
Chatsworth, California

WATTS THE REAL DAMAGE?

A typical PC does not draw 150 watts today. Tests show a range of 60 to 140 watts, with most drawing less than 100 watts. Bill Howard ("The Politically Correct PC") says a traditional system uses \$35 worth of electricity per year. If a traditional system draws 150 watts, the cost of electricity would have to be 2.7 cents per kilowatt hour. But, in fact, the national average is probably about 8 cents per kilowatt hour, with a range of 5 cents to 15 cents. An EPA "Energy Star" system drawing 60 watts would have to buy electricity at 2.3 cents per kilowatt hour in order to cost \$12 per year to operate.

Howard also states that it takes 1.5 watts of cooling energy to offset each watt of PC energy. That is not correct. A typical air conditioning unit adds about 0.3 watts for each watt of PC use.

Lawrence G. Spielvogel
King of Prussia, Pennsylvania

While pleased to see any airing of environmental matters in an influential computer magazine, I must take issue with Bill Howard's restatement of the widely held misconception that "a typical PC and monitor draws 150 watts today." That figure is hopelessly low.



***"Computers have no place
in the world the 'Greens'
are planning for us."***

The underestimate doubtlessly is caused by confusing input required with output supplied. Even the power supply of the original IBM PC, which was rated at a meager 63.5 watts of DC output, consumed 300 watts. My own 386/25 clone with a 200-watt power supply has, according to the statement on the power supply, a rated consumption of "90-130 VAC 6 AMP," or approximately 660 watts (110 volts times 6 amps). A 150-watt power supply would therefore consume 495 watts. A PC consuming 495 watts around the clock rather than 150 would cost \$346 per year in electricity, not \$105 as Howard concludes.

Norm Sabowitz
Halifax, Nova Scotia, Canada

• Volts times amps does equal watts, but what's stamped on the power supply only tells you the maximum safe load for the power supply, not that the PC is actually drawing anywhere near 660 to 720 watts. Two PCs we tested recently ("The Green Machine," May 25, 1993) drew 124 and 162 watts, including the monitors. (Some small, new systems may be closer to 100 than 150 watts.) Our calculation that contemporary PCs use \$35 of electricity yearly was based on a 150-watt system

running 9 hours each workday in a place where electricity costs 10 cents per kilowatt hour, as it does in the New York City area. You get roughly the same answer if it's 12 hours a day and 8-cent electricity, which is how the EPA does its calculation. A system left on around the clock burns \$105 to \$135 of electricity each year.—Ed.

HELLO, EGGHEAD? EUROPE HERE. COULD YOU SEND ME...?

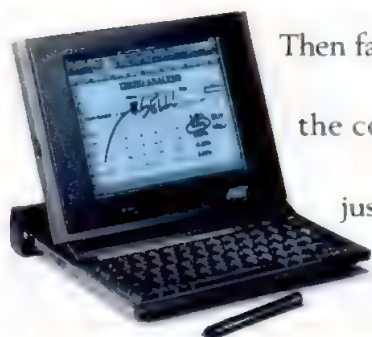
John C. Dvorak hit the nail on the head in his March 16, 1993, *Inside Track* when he criticized software companies' treatment of overseas users. I've lived outside the U.S. for nine years and have found it almost always cheaper to purchase software with a credit card from the U.S., with added costs of surcharges, airmail, and import duties, than to buy the same products off the shelf at "discount" dealers over here. And although I've registered many packages, I'm rarely notified of an upgrade. It's hard to justify the high prices paid here, and easy to see why virtually everybody I know with a computer has pirated software. Entertainment software vendors lead the pack in nonresponsiveness, though it seems they have the most to lose from piracy. There's a vast market for PC software outside the U.S.; I can't believe software makers won't acknowledge it.

Ed Senechal
Dortmund, Germany

THE FUTURE IS NOW

In "The Next Software Revolution" (March 30, 1993), Michael J. Miller writes that Microsoft, IBM, and Apple are "leading the way" to document-oriented computing, but he seems unaware that GO Corp. has had a document-oriented environment in its pen-based operating system, PenPoint, since it was released in April 1992. PenPoint supports not only the embedded objects but also embedded documents, where a drawing can exist inside a word processing document, which can exist inside a spreadsheet, and so on. What does the developer have to do in order to support this level of integration?

Now you can work with an instrument you're well versed in using — the pen — and still get full notebook functionality. Introducing the PenExec™ from AST. At first glance, it's a powerful portable computer with a large, clear screen. Then it quickly transforms into a pen-top, with a cordless pen for writing and navigating. You can take notes, annotate spreadsheets, sketch design changes or scribble Day-Timer entries.

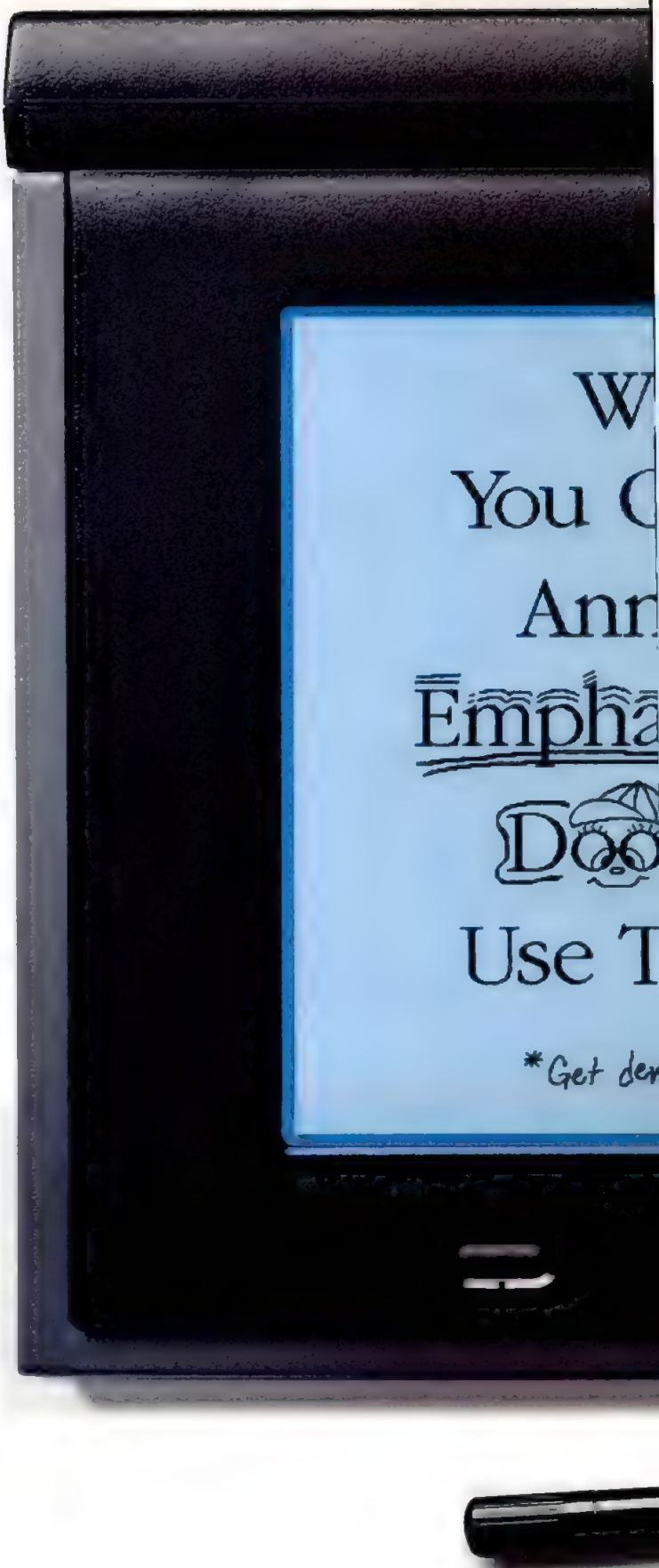


Then fax them anywhere in the country. To find out just how easy PenExec makes pen-top computing,

jot down this number: 800-876-4AST.

See? You already know how to use it.

AST. COMPUTER
The Product Of Our Obsession.



th PenExec,
an *Illustrate*,
otate,*Circle,
size, Comment,
dle Or Just
he Keyboard.
nstration. Call 800-876-4AST.

see
brochure

AST

PENEXEC

POWERFUL

Intel 386SL/25MHz microprocessor
with Advanced Power Management.

64KB external cache. Up to
20MB RAM. Built-in hard drive
with up to 200MB. Attachable
3.5" floppy disk drive.

FULL-FEATURED

Full keyboard. 9.5" backlit
VGA screen. PCMCIA slot for
communications and
network connectivity. 400dpi
digitizer and cordless pen.
Removable/rechargeable battery.

COMPATIBLE

Pre-loaded DOS 6.0, Windows 3.1
and Windows for Pen. Available
AST Pen Essentials software
with Day-Timer, Notetaker and
fax capabilities.

SUPPORT

ExeCare™ Plus includes free
one-year warranty with 48-hour
expedited repair or optional
24-hour replacement coverage.

Call for more information.
800-876-4AST



LETTERS

Absolutely nothing. All the behavior is inherited by each application from Pen-Point's object-oriented architecture. How can other players be leading the way to a place where GO Corp. has already arrived?

Barry Boone
Seattle, Washington

• **You're absolutely right. PC Magazine recognized GO Corp.'s pioneering efforts at Fall Comdex '91, when we gave the company an Award for Technical Excellence (December 31, 1991).—Ed**

QWERTY IS STILL QUIRKY

I have noted quite a number of items in *PC Magazine* about "alternative" keyboard designs ("Keyboards . Split," Trends, March 30, 1993). What these designs fail to recognize, however, is that breaking the keyboard in two in order to provide a more favorable hand/wrist angle is only half of the battle. These keyboards still feature a long-obsolete key layout.

When the QWERTY layout was designed in the early 1870s, touch typing had not even been thought of yet. The finger gymnastics required to touch type on a QWERTY keyboard are in large part responsible for many of the repetitive motion injuries associated with keyboards. It's time manufacturers improved this most basic user interface. Until all these new keyboards can provide custom layouts, though, none of them can truly be considered "ergonomic."

Randy Cassingham
Upland, California

A VIRUS BY ANY OTHER NAME...

In your review of our product, Victor Charlie ("Antivirus Software: Keeping Up Your Guard," March 16, 1993), you note that the program's signature library doesn't name viruses, and you describe this as idiosyncratic. On the contrary, it is the naming of viruses that is idiosyncratic. The 13 viruses used in your testing, for instance, are known by 47 different names. Both the flamboyant naming of

viruses and the intense task of identifying viruses and their strains arguably encourage the writing of new and different viruses.

One way we approached research was to develop an antivirus program to capture virus signatures on the fly, making it possible to detect and track new file-infecting viruses with no name of any kind. Indeed, many viruses will never have names. Detection of a large number of viruses is of no interest to the user with only one virus loose on his or her machine or network.

Alan Dawson
Bangkok Security Associates
Bangkok, Thailand

A FONT IS A FONT IS A FONT

I think it would be useful if *PC Magazine* printed a chart of equivalent Windows fonts. I had the TrueType fonts that come with Microsoft Windows 3.1. Later I purchased Bitstream's TrueType font package and MicroLogic's MoreFonts. While I don't have a large financial investment in fonts, I think I've spent my money unwisely because font manufacturers don't make it clear that one of their font styles under one name is nearly equivalent to a font under another name. For example, the MoreFonts Journal font could be a Courier font.

James Egan
North Tarrytown, New York

CORRECTIONS AND AMPLIFICATIONS

Since the Texas Instruments family of microWriter LED page printers was named as a hot prospect ("New & Improved," April 27, 1993), the PostScript versions have been upgraded to include more PostScript fonts at no extra cost. The microWriter PS17 is now the PS23 (with 23 PostScript fonts) and costs \$999; the PS35 is now the PS65 (with 65 PostScript fonts) and costs \$1,299.

In our January 26, 1993, review of 66-MHz 486DX2 systems, we indicated that Packard Bell did not participate because its system had been removed from the market. To clarify, when we requested a unit for review, Packard Bell was in the process of developing a new line of 486 PCs and chose not to send an older model. In January the vendor announced 60 new 486-based configurations, including 66-MHz 486DX2-based models.

In the same review of 66-MHz 486DX2 systems, we stated that the Hyundai 466D2 was the last of the company's older line of PCs. In fact, the system is the flagship desktop PC of Hyundai's new product rollout that took place in October 1992.

In the March 16, 1993, feature article "14- and 15-Inch Monitors: Mainstream Choices," we incorrectly reported that the Compaq QVision 150

Color Monitor is manufactured for Compaq by Zenith Data Systems; in fact, it is manufactured by Zenith Electric Corp. Additionally, the monitor consumes 115 watts of power (not the reported 173 watts) and does have an autosensing power supply.

In our First Look of Paradox for Windows (March 16, 1993), the fact file incorrectly stated that the database program works with Microsoft Windows, Version 3.0 or later. Paradox for Windows works only with Windows 3.1.

Regarding our November 10, 1992, review of networking hubs ("Empire Builders: 6 Enterprise Hubs"), several factual errors appeared in the review of Lannet Data Communications' MultiNet LET-36. The Lannet product does have STP Token-Ring modules; it supports single-mode fiber Ethernet; all modules allow individual port control and reconfiguration; and although we said you can install a server on the hub, in fact you cannot.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments and suggestions. Please send correspondence to Letters, *PC Magazine*, One Park Ave., New York, NY 10016-5802, or upload it to PC MagNet (see page 12 for access information). All letters become the property of *PC Magazine* and are subject to editing.

WHEN REMOTE ACCESS PRODUCTS WERE TESTED IN THE ARIZONA DESERT, GUESS WHO HAD THE HOTTEST SOLUTION?

The test was part of a comprehensive analysis of remote network access solutions done by *Corporate Computing*. They packed up nine dial-in server products and sent a technician out to do some real field testing—in the town of Sedona, Arizona, pop. 7940.

He dialed in to the ZD Labs LAN in Foster City, California. And when he logged off, he had a winner: Remote LAN Node® (RLN™) from DCA®—a unique software solution that lets up to 16 remote users dial in at once and function just like locally connected PCs.

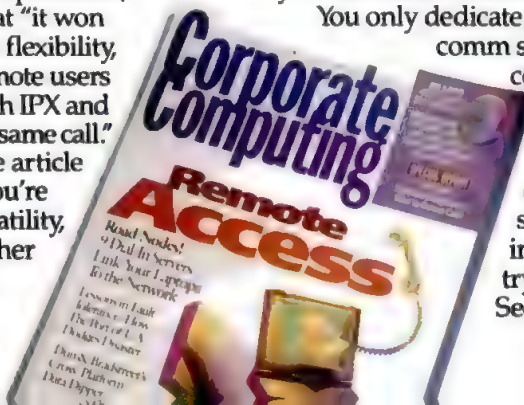


RLN PROVED IT COULD TAKE THE HEAT.

We'll let the article do the talking. "The best product was Remote LAN Node—a software solution that acts like a multiprotocol router when installed on a PC on a LAN."

The magazine went on to say, "Our winner, DCA's RLN, stood out for its capability to handle multiple communications protocols," commenting that "it won hands-down on flexibility, allowing our remote users to connect to both IPX and IP servers in the same call."

All in all, the article concluded, if you're looking for versatility, "None of the other units we tested came close."



THE BEST SOLUTION UNDER THE SUN.

Remote LAN Node extends the full capability of the network to remote users, allowing them to function as true remote nodes. RLN is both protocol- and application-transparent. So you can access any network protocol, such as IPX/SPX (Novell®), SPP/IPC (Banyan®), NetBEUI (Microsoft®) and TCP/IP—or any interconnected combination. And, as *Corporate Computing* pointed out, you can access them simultaneously.

You only dedicate one PC as a comm server for 16

concurrent

users. And RLN offers three levels of configurable security, including the industry's first Remote Security Adapter.

GET IT WHILE IT'S HOT.

We've quoted *Corporate Computing* a lot. But we'd like you to see more than a few isolated sentences. So call and we'll send you a reprint of the article. We'll also send an informative booklet, "Just Like Being There—A Guide To Remote Network Access."

And finally, we'll send a free copy of RLN client software, so you can dial in to our LAN Lab server and judge for yourself.

You won't have to go to the desert. Or even leave your office. But you'll find yourself in a whole new world.

1-800-348-3221, ext. 46A*

THE FREEDOM
TO COMMUNICATE.

DCA

CIRCLE 389 ON READER SERVICE CARD

*Call (404) 475-8380 if outside the U.S. and Canada. ©1993 Digital Communications Associates, Inc. All rights reserved. DCA and Remote LAN Node are registered trademarks and RLN is a trademark of Digital Communications Associates, Inc. All other trademarks are property of their owners.

SEE US AT SPRING COMDEX BOOTH #N6848.

386SL CONTENTDA

PACKAGE I:

\$1495

- CPU: Intel 386SL
- Processor Speed: 25MHz
- Memory: 2MB expandable to 10MB
- Hard Drive: 80MB
- Display: VGA backlit, 640x480, .23mm dot pitch, 256K video RAM, Sharp 7.4" diagonal, up to 64 shades of gray
- Battery: NiMH; operating time up to 4 hours; a snap to remove
- Size: 9.7" x 6.1"
- Weight: Only 3.9 lbs.
- Power Management: Fully featured, including Deturbo, Standby and Suspend to disk
- Keyboard: Comfortable 80-key with embedded numeric keypad
- I/O Ports: 1 serial and 1 parallel standard; ports for optional internal modem, external 3.5" floppy and external color VGA or SVGA monitor
- Pointing Device: Easy-to-use built-in trackball
- Warranties & Guarantees: ZEOS award-winning 24-Hour Toll-Free Technical Support, 30-Day Absolute Satisfaction Money-Back Guarantee, complete Customer Satisfaction Package

386SL CONTENTDA

PACKAGE II:

\$1795

We take Pkg. I and upgrade to 4MB RAM, add an external 3.5" floppy drive, DOS, Windows and Lotus Organizer!

386SL CONTENTDA

PACKAGE III:

\$1995

All of pkg. II plus a nylon carrying case, extra battery, and internal 9600/2400 baud fax modem. The whole enchilada for less than \$2000!

Your ZEOS[®] Now with 386SL

"...if you're looking for a subnotebook and want to make next to no compromises, then the \$1495 ZEOS Contenda is your best bet."

—PC Week, February 1, 1993

PC Week calls the ZEOS Contenda "the best yet of the new crop of lightweight, full-featured machines." We weren't satisfied with "best yet"—so we've made it *even better*. Because now you get your choice of a 386SL or 486SL CPU!

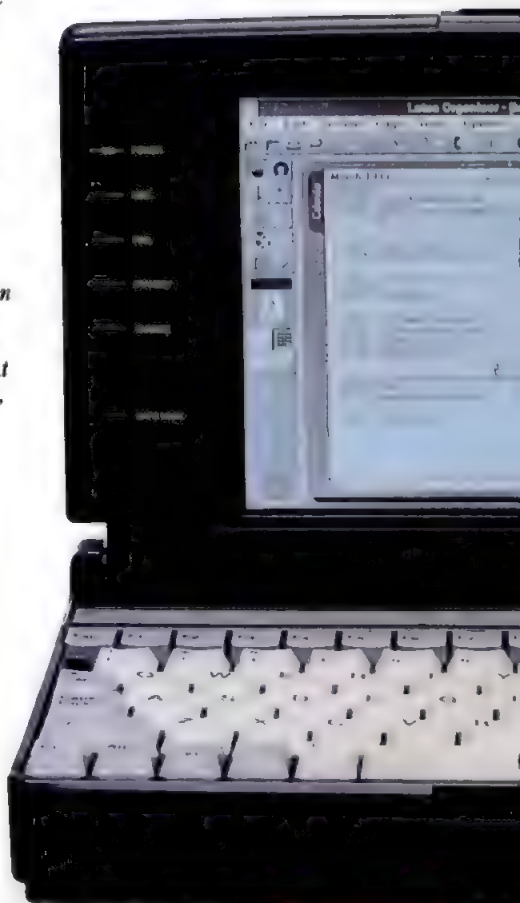
FEATURES THAT PULL NO PUNCHES.

Start by checking out the 386SL. The specs are on the left. It's impossible to find a notebook on the market today that's this light, this small, this affordable—and still gives you *so much power*. But it's all here.

For instance, there's the smart SL processor. According to *PC Magazine*, when it comes to notebooks, look for Intel's SL processor. The ZEOS Contenda's CPU extends your battery life significantly—because it's intelligent enough to power-down the memory, disks, modem and more when they're not in use.

What's more, its features make it a pleasure to use. Such as a crisp, vibrant VGA backlit screen. A built-in track ball. Enough power and memory to easily run Windows. And at less than 4 pounds in weight, it's probably lighter than your briefcase!

Smaller than a notebook, powerful as a desktop. At only 3.9 lbs., the ZEOS Contenda keeps you light on your feet.



Contenda:TM or 486SL CPU!

486SL OR 386SL:

IT COULD BE THE ONLY PC YOU'LL EVER NEED!

The 486SL gives you everything the 386SL version does, plus a few choice enhancements: 3.3 volt technology for added battery life, extra video RAM, PI local bus for Windows acceleration, and a high-speed floppy drive controller.

Take your pick. You'll find both Contendas give you the power and room for practically everything you'd use in a desktop system. You can easily run DOS, Windows and Windows applications. *And you can get all three*—including the new Lotus Organizer—the personal information manager that's so easy to use, it could make your Day Timer obsolete. Check out our upgrade packages for details. Then give us a call!

YOU GET CUSTOMER SUPPORT THAT'S THE BEST IN THE BUSINESS.

Our relationship with you doesn't end once we ship your Contenda. ZEOS pioneered comprehensive customer support, and it's what keeps our customers coming back again and again. We back all of our products with Toll-Free Technical Support, 24 hours a day, 365 days a year.

And we guarantee your satisfaction. If you're not absolutely convinced your new ZEOS Contenda is everything we say and more, you have a full 30 days to return it to us for a complete, no-questions-asked refund. Plus, you're covered by our One Year Limited Warranty and much more. You're going to be very satisfied. *We guarantee it!*

CALL NOW TOLL FREE
800-554-7172

Fax: 612-633-1325
Govt.: 800-245-2449
Hearing Impaired (TDD):
800-228-5389, Outside U.S.

and Canada: 612-633-6131. MasterCard, VISA, AmEx,
Discover, Z-CardSM COD and affordable leasing
programs. Open 24 Hours A Day, 365 Days A Year!



486SL CONTENDA PACKAGE I:

\$1795

- CPU: Intel 486SL operating at 3.3v
- Processor Speed: 25MHz
- Intel's PI local bus for video acceleration!
- Memory: 4MB operating at 3.3v
- Hard Drive: 80MB
- Display: VGA backlit, 640x480, .23mm dot pitch, Sharp 7.4" diagonal, up to 64 shades of gray
- 512K 3.3v video RAM
- Local bus video controller operating at 3.3v
- Battery: NiMH; operating time up to 5 hours with power management
- Size: 9.7" x 6.1"
- Weight: Only 3.9 lbs.
- Power Management: Fully featured, including Deturbo, Standby and Suspend to disk
- Keyboard: Comfortable 80-key with embedded numeric keypad
- I/O Ports: 1 serial and 1 parallel standard; ports for optional internal modem, external 3.5" floppy and external color VGA or SVGA monitor
- Pointing Device: Easy-to-use trackball
- Warranties and Guarantees: ZEOS award-winning 24-Hour Toll-Free Technical Support, 30-Day Absolute Satisfaction Guarantee, complete Customer Satisfaction Package

486SL CONTENDA PACKAGE II:

\$1995

You get all of Pkg. I, plus external floppy, DOS, Windows and Lotus Organizer!

486SL CONTENDA PACKAGE III:

\$2395

We upgrade Pkg. II to 8MB of RAM—and add a custom-fitted nylon carrying case, additional battery and fax/modem. Perfect for road warriors!

CIRCLE 036 ON READER SERVICE CARD

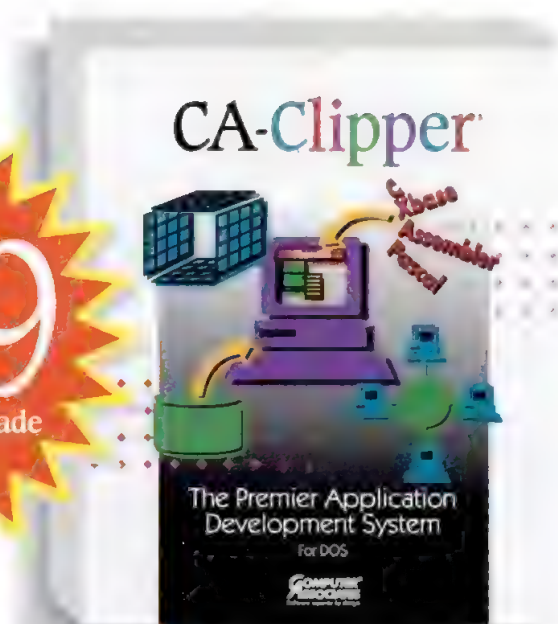
All products and company names are trademarks or registered trademarks of their respective holders. ©1993 ZEOS International, Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company. (NASDAQ symbol: ZEOS). SN2-PCM-9306A.

Outrageous

New Competitive Upgrade Paradox, Access And AR

\$199

Competitive Upgrade
Offer!



The Complete, Professional Programming Environment For Xbase.

CA-Clipper® 5.2 is a robust language, an efficient linker, a flexible pre-processor and a high-performance compiler. It includes: an editor, debugger and make utility, forming a comprehensive system for creating and distributing PC and LAN-based applications.

**Faster Access, Faster
Screen Writes, Faster
Performance.**

Address up to 32 megabytes of mem-

ory — with shorter access times. New Expanded Memory System (EMS) capabilities including LIM 4.0 support, plus a Virtual Memory Manager that uses

dynamic overlays to let you exceed available RAM. You also get faster screen writes, thanks to RSIS compliance.

Feature	CA-Clipper	FoxPro	dBASE IV
Lexical Variable Scoping	YES	NO	NO
User defined constants	YES	NO	NO
Code Blocks	YES	NO	NO
Nested Multi-dimensional Arrays	YES	NO	NO
Predefined Object Classes	YES	NO	NO
Variables Modifiable in Debugger	YES	NO	NO
Customizable Readable Error Handling	YES	NO	NO
Reads and Writes FoxPro® dBase Files	YES	YES	NO
Reads and Writes dBASE III+ .ME .X .F .P .T	YES	NO	YES
Reads and Writes Paradox®, dBase IV, Files	YES	NO	NO

Comparison based on FoxPro Version 2.5 for DOS and dBASE IV Version 1.5

Enhanced Source-Level Debugger For Improved Stability.

It's one of the most powerful debuggers in the Xbase world. Easy to use and completely interactive.

New RDDs For FoxPro, Paradox and dBASE IV.

Replaceable database drivers for all the most popular development systems.

s Upgrade.

Can Save dBASE, FoxPro, AGO Users Up To \$1,291!

\$199 Includes Your Choice Of Any One Of These Products Absolutely FREE!
Offer Good For Users Of Any Competitive DBMS – Call Today!



Over 550 time-saving, problem-solving functions in one high performance package. Raise your productivity with this valuable library.



Compile almost any dBASE IV application in three easy steps – and produce executable (.EXE) files with the speed and efficiency of CA-Clipper.



dBASE apps come alive with new CA-dBFast 2.0 – the first dBASE-compatible database and language for Windows.

Open Architecture Gives You Freedom To Grow.

Customize Clipper with user-defined commands and functions. And seamlessly integrate modules from languages such as C, Assembly, dBASE and Pascal.

No runtime fees, no additional licenses, no LanPaks. Enjoy free distribution of your applications by producing executable (.EXE) files.

This Offer Is Good For A Limited Time – Call Today.

This special Competitive Upgrade Offer is good for a limited time only, so don't

delay. Call right now and save a fortune while you upgrade to the new standard in Xbase application development.

COMPUTER ASSOCIATES
Software superior by design.

**SEE YOUR LOCAL DEALER TODAY
OR CALL 1-800 CALL CAI EXT. 176.**

Operators are standing by to take your order. Offer good for a limited time only, so don't wait. Call today!



DBA Readers' Choice Award
Development Language Best Value
Computer and Best Development Product

PC Magazine Editors
Choice for Value
Development

DBMS Readers' Choice
winner for client-server
development system

CIRCLE 075 ON READER SERVICE CARD

New CA-Clipper® 5.2.

© Computer Associates International, Inc., One Computer Associates Plaza, Islandia, NY 11788-7000. 1-800-225-5224. All product names referenced herein are trademarks of their respective companies.

INTRODUCING THE ULTIMATE UTILITY FOR COMPRESSED DATA RECOVERY.

So you're working with compressed data, huh? You need the Norton Utilities 7.0.

NEW FEATURES

- Complete DOS 6.0 Support
- Automatic Compressed Data Recovery
- Advanced Recovery Mode for Physically Damaged Disks
- Large Hard Drive Support up to 2 Gigabytes
- Optimization of Compressed Data
- Hardware Diagnostics

This new version of the world's best-selling utility not only supports your regular files, but also offers total protection for DOS 6.0 DoubleSpace, Stacker, SuperStor, and SuperStor Pro files. No other single product gives you such complete compressed data support.

With Norton Utilities 7.0, compressed data users can take full advantage of the features Norton is famous for.

Like Speed Disk, which defragments your files for faster disk access and improved data recovery. And the Norton Disk Doctor, which identifies potential problems inside your system, and then automatically eliminates

them. Only Disk Doctor has automated repair functions—nine of them in all—designed especially for compressed data problems.

Norton Utilities 7.0 also comes with the new Norton Diagnostics. It analyzes and tests all vital system components, including memory, communication ports,



From Peter Norton, the leader in data recovery software.

and system boards. This helps prevent data loss due to sudden system lock-ups. And gray hairs due to data loss.

What's more, our Disk Editor is now armed with something we call Advanced Recovery Mode. For the first time, you can actually recover data from physically damaged disks. (Perfect for times when they mysteriously find their way into your coffee cup.)

To pick up Norton Utilities 7.0, take advantage of the upgrade offer below.

Your compressed data will thank you.

Now current customers can pick up the Norton Utilities 7.0 for up to \$130 off the suggested retail price. Here's all you do:

To Upgrade from Norton Utilities:
Send us the original first page from any version of a Norton Utilities manual* and Norton Utilities 7.0 is yours for only \$49*—you save \$130.

To Upgrade from PC Tools (any version):
Send us the original first page of your manual* and we'll send you Norton Utilities 7.0 for only \$99*—you save \$80.
Disk size ☐ 5 1/4 HD ☐ 3 1/2 HD

For faxed information call 1-800-554-4403*. To order directly call 1-800-453-1062 (code AA27) or fax your order to 303-727-4611. Or enclose this card and your payment in an envelope addressed to: Symantec Fulfillment Center; Attn: Norton Utilities Offer AA27; P.O. Box 22335, Denver CO 80222-9509.
☐ Check ☐ M.C. ☐ Visa ☐ Amex

CARD NUMBER	EXP
SIGNATURE	PHONE
NAME	COMPANY
ADDRESS	
CITY	STATE ZIP

*No photocopies please. Limited to one copy for each proof of ownership.

Plus \$8.50 shipping and handling and applicable sales tax for AZ, CA, CO, CT, DC, FL, GA, IA, IL, IN, MA, MI, MD, MN, MO, NJ, NY, OH, PA, TX, VA, WA, WI. Include applicable local tax for AZ, CA, CO, GA, NY, MN, OH, TX, VA, WA, WI. Offer good in U.S. only.

Please attach order form with payment. Allow 2 weeks for processing your order. No P.O. Boxes or C.O.D.s accepted.

**THE NORTON
UTILITIES**
SYMANTEC

*Choose option 1, select document 475. Valid in the U.S. and Canada only. For more information in Europe, call 31-71-353111. In Australia, call 612-979-6577. In Canada, call 1-800-465-2268. Everywhere else outside U.S., call 404-252-3570. Other names are trademarks of their respective holders. Actual retail price may vary. ©1993 Symantec Corporation. If you are tax exempt, please include exemption certificate or letter providing number. Resellers are not eligible.

CIRCLE 344 ON READER SERVICE CARD

Trends

TRENDS & TECHNOLOGY SHAPING THE PERSONAL COMPUTER MARKET

TV Wannabes

PC video to approach TV quality.

Playing motion-video clips on the PC is a great idea. But today's PC movies are often disappointing. Most of the time, they just don't look as good as television. Fortunately, several developments will enable vendors to deliver improved motion video soon. Better codecs (al-

gorithms that handle the compression and decompression), video-optimized hardware and software, and faster CPUs combined with local-bus system architectures will all bring PC video closer to TV quality.

Many variables affect the quality of video playback, including the quality and content of the captured image, the CPU and video subsystem, and the codec.

"The state of the art today for software-only playback is 320 by 240 pixels at 15 frames per second," says Steve Linowes, product manager of Microsoft's Video for Windows. "In the next six to twelve months," he says, "we should see that go up to 640 by 480 at 20 to 24 fps, and eventually to 30 fps," the frame rate of broadcast TV.

Microsoft's Video for Windows ships with three codecs—Intel's Indeo, and Microsoft's Video1 and Run Length Encoding (RLE)—all of which are being tweaked. Indeo, for example, can now capture 320 by 240 at 15 fps and has improved playback, which is limited to 160 by 120 at 15

fps. Other codecs are improving, too. Apple's QuickTime for Windows is expected to include the Compact Video codec, which can handle playback at 320 by 240 at up to 30 fps on a 33-MHz 486. And Iterated Systems is bringing its fractal compression technology for still images to motion video; its \$1,795 VideoBox developers' kit for DOS handles playback of 320 by 200 at 30 fps.

PC movies will soon be able to run in a wider variety of environments as a group of vendors that includes Microsoft and C-Cube Microsystems Corp. develop a standard file format for Motion-JPEG (not to be confused with MPEG—Motion JPEG is the video extension of the still-image JPEG technology). The new file format will become part of Video for Windows' .AVI scheme.

Hardware is becoming more attuned to video. Graphics adapter-maker ATI Technologies has developed a suite of drivers that optimize the three codecs that ship with Video for

Windows for ATI's mach32 graphics chip. Just as Windows graphics accelerators work by speeding up functions frequently used by graphics (such as bitblts), ATI's Multimedia Video Acceleration drivers speed up functions frequently used by video (such as stretch-blits).

As capture boards get better and cheaper, the potential for better playback will grow. Intel's new \$699 Smart Video-Recorder, for example, captures at 30 fps (but doesn't accelerate playback).

Finally, as more and more PCs use faster, more powerful CPUs (such as Intel's Pentium) and local-bus architectures (VESA's VL bus or Intel's PCI), motion-video playback on the PC will just get better and better.—Mary Kathleen Flynn

Next Year: DOSless Windows

ALTHOUGH MICROSOFT EXECUTIVES are focusing primarily on this year's operating systems—DOS 6.0 and Windows NT—some details about next year's DOS and Windows releases are beginning to emerge.

MS-DOS will continue to be improved as an end-user environment but not as a development environment, says Brad Chase, general manager, MS-DOS. "So 32-bit improvements for applications will come at the Windows level." DOS enhancements will focus on "conventional memory, utilities, portable computing, and taking further advantage of the 386 architecture—protected multitasking, for example." In addition, he says, "We may put things in MS-DOS that will help Windows apps run faster."

Code-named Chicago, the next version of Windows will not need DOS in order to run. Like Windows NT, it will have a lot of 32-bit code. According to Joe Krawczak, product manager for Windows, the next release "will borrow elements from Cairo," Microsoft's long-term project aimed at developing a more object-oriented interface that is more aware of distributed computing environments.

—Mary Kathleen Flynn



Pipeline *By Robin Raskin*

Springtime for Lotus

Maybe it's the Boston weather, but for the past three or four years, Lotus's seeds of new technology didn't take root. But now it appears to be springtime for Lotus. The recently announced flowers are Lotus Notes 3.0 and Lotus 1-2-3, Release 4.0, for Windows. Two others, Freelance Graphics for Windows and Lotus Improv, recently shipped, and a new Ami Pro for Windows (4.0) should soon be announced. Individually, each merits its own welcome.



Together they provide a set of apps that share common technology. Here are four areas to keep your eyes on: common code, Chronicle (codename for Lotus's version tracking), database replication, and multimedia.

While many vendors talk about sharing code between apps, Lotus makes good. Freelance, AmiPro, and 1-2-3 share a single spell checker and dictionary housed in a single Lotus apps directory. SmartIcons, Status Bar, Dialog Editor, and Mail Enabling will also share the same code in the form of .DLLs.

Lotus's Chronicle technology was first discussed back in 1990. It's been slowly lumbering to life and will debut in 1-2-3 Release 4 as Version Manager. Created to take spreadsheet workgroup computing beyond file sharing, Version Manager allows you to assign a series of values or formulas to a spread-

sheet cell or range and then track and version those values. Explains Jeff Beir, vice president of the spreadsheet division, "People want to document their assumptions; work on the same model concurrently, tracking who made what changes when; get notifications; and do it in a secure environment." A single user might track personal versions of a spreadsheet; a networked group could use the file server to track and then consolidate disparate versions with a Merge.

The big win comes for 1-2-3 users who use Notes, too. The combination of Notes and 1-2-3 turns ranges into objects within the Notes database. Notes informs users as changes are posted to a worksheet. Since Notes databases can be replicated, or synchronized across multiple servers, you are guaranteed that up-to-date information is distributed throughout the system. With Chronicle and replication technologies in tandem, you can track versions across large groups. We expect to see Version Manager become part of all Lotus apps, not just spreadsheets.

Lotus is also revving up for a networked multimedia strategy. In the past year, products included Lotus Sound, Media Manager, and Annotator—mini apps that make multimedia creation and browsing easier. Ultimately, these mini apps will join the ranks of shared code; along with versioning and replication, multimedia messaging across the network becomes a natural.

Common code, Chronicle, replication, and multimedia are diverse but useful technologies that bring a breath of fresh air to the Lotus product line.

Robin Raskin is an executive editor of PC Magazine.

Color Lasers?

FROM THE DAY HEWLETT-PACKARD introduced the original LaserJet printer, PC users have dreamed of two things: the \$1,000 laser printer and the cheap color laser printer. The first dream has already been realized. This year, printer manufacturers will take the first steps toward making the second dream come true.

Color laser printers are already more than wishful thinking. But today's color lasers aren't exactly aimed at the ordinary user: They cost \$30,000 (and up) and have more in common with copying machines than they do with HP LaserJets. As Donald Park, executive vice president at printer maker QMS, explains, the color laser that PC users would buy would have all the advantages of a monochrome laser: 8-page-per-minute speed, desktop size, dependable print quality, quiet operation, and the ability to print on plain paper.

But while defining the ideal desktop color laser may be easy, producing it at a price PC users can afford is very tough indeed. According to A.J. Rogers, a strategic marketing manager at color printer manufacturer Tektronix, the challenges include

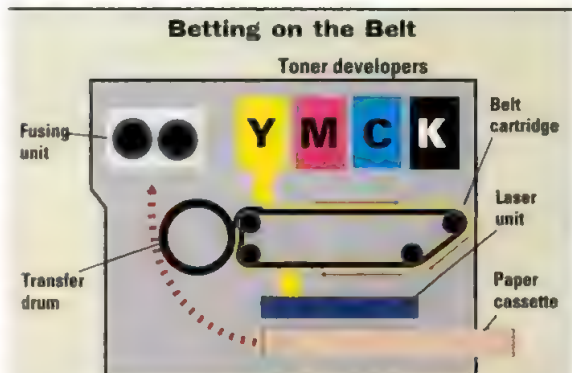
ghosting, uneven toner layers, color contamination, registration, and reliability.

A color laser printer is fundamentally more complex than a monochrome one because there must be four separate developers—one each for black, cyan, magenta, and yellow. There are currently two ways of approaching this problem: One method is to use a very large photoconductor drum with four separate passes. This is how copiers, such as Canon's CLC products, handle color. The other approach is to use four separate photoconductor systems.

Some companies are exploring using a photoconductor belt that processes each color plane while transferring it to a drum, where the four-color image is built. Then the drum transfers the final image to the paper. This method requires four imaging passes but only one transfer to paper. The advantages are smaller size and improved registration. Bill Flynn, an analyst at BIS Strategic Decisions, says this technique has promise.

Despite all the technical problems, color

lasers are expected to debut this year. The first machines will be expensive—around \$15,000—which will keep some players away. HP plans to wait until prices drop below \$10,000 to enter the market. HP and Lexmark International both say ink jets will solve most color printing needs.



A new approach to color laser printers uses a photoconductor belt to process each color plane while transferring it to a drum, where the four-color image is built. Then the drum transfers the final image to the paper.

By the mid 1990s, color lasers should cost around \$7,000. Will they ever get to that magical \$1,000 price point? "Not this decade," says Tektronix's Rogers.

—Mary Kathleen Flynn

Businesses Play War Games

FOR CENTURIES THE WORLD'S armies have used simulations to map battle campaigns before committing troops to war. Other professions incorporate simulations for training purposes when using the real thing is impractical or outrageously expensive. Flight simulators, for example, are used to instruct pilots in taking off and landing at a slew of airports and in whatever weather condition the instructor dials up. So it should come as no surprise to see a simulation that is being used to train business executives in running a business.

Top Retail Software

Current ranking	Last issue	Product/company
1	1	MS-DOS 6.0 Upgrade Kit Microsoft Corp.
2	13	WordPerfect 5.2 for Windows Upgrade Kit WordPerfect Corp.
3	12	WordPerfect 5.2 for Windows WordPerfect Corp.
4	—	Quicken 2.0 for Windows Intuit
5	6	Stacker 3.0 Stac Electronics
6	2	Microsoft Windows 3.1 Microsoft Corp.
7	4	QEMM-386 6.0 Quarterdeck Office Systems
8	—	Quicken 6.0 Intuit
9	—	WordPerfect 5.1 Upgrade Kit WordPerfect Corp.
10	7	Paradox for Windows Borland International Inc.
11	3	Lotus Improv for Windows Lotus Development Corp.
12	10	Quattro Pro for Windows Borland International Inc.
13	—	PrintCache 3.1 LaserTools Corp.
14	8	Microsoft Windows 3.1 Upgrade Kit Microsoft Corp.
15	—	Money for Windows 2.0 Microsoft Corp.

This list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending April 3, 1993. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market. Sales information compiled by Ingram-Micro.

The kicker is, the tool that's being used is a game. Maxis, the maker of SimCity, SimEarth, and SimLife, has opened a new division devoted to developing simulation games for business and government. The first business simulation was SimRefinery, which it developed for Chevron. SimRefinery teaches managers how to run a refinery. It allows them to define the products, raw materials, and operating conditions.

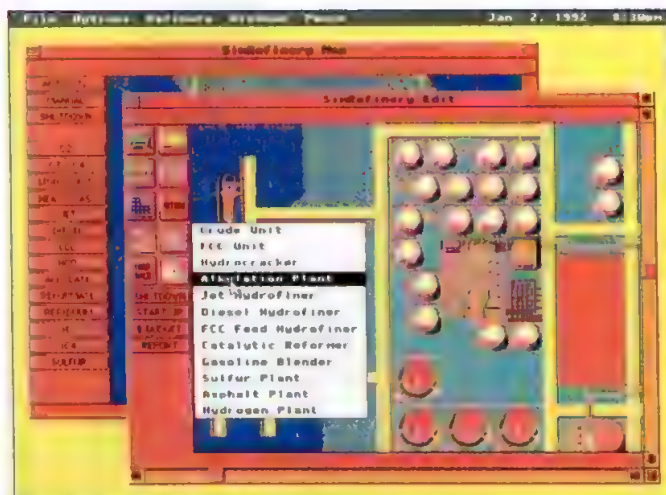
The simulation comes with a supporting text that walks the pupil through the refinery. SimCity and SimEarth users would feel comfortable exploring the property because it uses similar graphics. But unlike commercial games, the simulations don't have all the features enabled. It may look like a game, but only those aspects that actually teach the business are operational.

During the training session, the student manager of SimRefinery establishes goals by choosing the products the refinery will make, selects the crude oil to process, and controls how much raw material the refinery receives. Using proprietary terms and conditions the manager should be familiar with, the manager must choose the right components and recipes. If successful, the refinery will show a profit; if not, a loss.

After SimRefinery, Maxis created SimEnvironment, which lets companies measure how their moves affect the environment. On tap is a power-utility simulation being developed for the Energy Power Research Institute. The product will teach not only how to control a power grid but also how to develop power conservation and do long-range planning.

Because of the programming time required to customize a simulation, these games don't cost \$100. They are priced more in the \$50,000 and up range; Chevron paid \$75,000 for SimRefinery. The simulations fit into a company's traditional training structure as part of a curriculum.

According to Maxis, instead of providing specific hands-on technical expertise, business simulations are best used for crude overviews of entire systems. Targeted at vice presidents and middle managers who may have specialty knowl-



SimRefinery teaches managers how to run a refinery.

edge, the simulations allow them to work through big-picture issues.

—Christopher Barr

Finding Voters On CD-ROM

JOHN ARISTOTLE PHILLIPS, THE Princeton university student who gained fame in 1978 when he used readily available public documents to draw up the plans for an atomic bomb, is now selling CD-ROM disks that make it easier for anyone trying to publicize a cause, start a political movement, or run for office to get access to lists of registered voters.

Aristotle Industries makes two products that are changing the way constituencies get built (800-243-4401, 202-543-8345). Anyone who wants to pay 2 cents a name can get Democracy Discs, CD-ROM-based state-by-state lists of 118 million registered voters. The company also sells software that sorts the names into all kinds of special interests, such as retired Republicans from California who vote regularly. Another CD-ROM, called Fat Cats, lists 529,000 contributors to federal candidates, dating back to 1985.

Lance Copsey, political director of the Maryland Republican Party, used CDs in the 1992 elections to generate phone call lists efficiently and inexpensively. "The CDs allowed us to get a really good response rate," he explains, "because we targeted only people who voted in the last three primaries and were therefore more likely to contribute to the campaign."

—Don Willmott

Caveat XA

DROVES OF USERS ARE BUYING CD-ROM drives, hoping to tap into the high-storage capacities (ideal for digitized video) that CD-ROM offers. Many, however, will be disappointed by the audio and video quality of CD-ROM software. The first level of a CD-ROM standard, MPC, was woefully underpowered. The next level you'll be hearing about, called CD-ROM XA, is arguably better than MPC but seems to be dying on the vine.

CD-ROM XA (eXtended Architecture) defines the way audio and video data can be written to (and eventually read from) a CD-ROM disk. There are two levels of XA compatibility: One defines the video storage component, the other adds compressed audio called ADPCM. The goal is to make it possible to play CDs with synchronized sound and pictures, rather than the poorly-dubbed-Hercules-movie-effect available under MPC now. XA does this by interleaving audio and video together into a single stream. When played back, the data stream is split into its different elements and presented simultaneously, and at a higher bandwidth than MPC.

The failure of XA has two causes: lack of XA hardware and a dearth of XA software. While some of the new high-end CD-ROM drives are XA-compatible and some current CD-ROM drives can be retrofitted with XA firmware, the bigger problem is software. Even with the stream of CD-ROM titles being rushed to market, very few are CD-ROM XA. And the few that are available, such as Newsweek Interactive, require specialized hardware, such as the Sony Multimedia Player.

Even though Microsoft (which spearheaded MPC) announced three years ago that it would support XA, the company has yet to release an XA CD-ROM title or to put XA support in an operating system. Only IBM has endorsed XA as a standard for its line of multimedia PCs, called the UltiMedias.

Like most emerging hardware platforms (such as pen computers), XA does not have a compelling killer application to lure buyers away from MPC. Kodak's Photo-CD will drive the short-term interest in XA because its present incarnation uses a version of XA for static images. A future version of Photo-CD will incorporate the audio aspects of XA. It may still be years, however, before XA really starts to catch on.

—Christopher Barr

Briefs

PBX SUPPLIERS AT&T, NORTHERN TELE-

com, and Siemens Rolm are helping Intel and Microsoft define Windows Telephony, which will integrate PCs and telephones. Other efforts to merge the technologies include Telephony Services (AT&T and Novell) and NotePhones (Siemens Rolm and Apple).

WOULD UNIX USERS RATHER SWITCH?

Thirty-seven percent of the 1,100 UniForum attendees who participated in Dun & Bradstreet Software's opinion survey think Microsoft's Windows NT will offer benefits not yet provided by Unix.

THE PC PRICE WARS CLAIMED ANOTHER

victim when direct marketer FastMicro closed its doors.

DATAPRODUCTS IS WORKING ON A WIN-

dows GDI printer. Expected to ship this

summer, the 8-page-per minute printer should cost around \$1,000. Other GDI-based printing products include Destiny's WinStyler controllers, LaserMaster's WinPrinters, and Microsoft's Windows Printing System.

ADAPTEC, LIKE NCR, IS DELIVERING A SINGLE-CHIP SCSI HOST ADAPTER, WHICH WILL MAKE IT EASIER TO PUT SCSI ON THE SYSTEM BOARD. (Trends, April 27, 1993.)

POETS ARE USING PCS TO PUBLISH THEIR interactive works. Robert Kendall, a PC Magazine contributor, distributes Soft-Poems on disk (11 Willow St., Cranford, NJ 07016) and on CompuServe's LIT-FORUM. Rod Willmot publishes "Everglade," a hypertext poem, on disk (819-566-6296) and on the Digital Publishing BBS (205-854-1660).

—Mary Kathleen Flynn

Spreadsheet Without Cells

SPREADSHEETS HAVE GOTTEN much easier to use over the last couple of years with such features as scenario managers, but the fundamental concept of rows and columns hasn't changed much. Lotus

Improv (which now runs on Windows), with its support for multidimensional modeling and natural-language descriptors, is probably the most intuitive one to date (First Looks, April 27, 1993). But this summer, a startup company called the DS Group will deliver a Windows spreadsheet whose interface is a radical departure from the rows and columns of the archetypal Lotus 1-2-3.

The DS Group's DS Lab is a spreadsheet without cells. Instead of filling in a matrix of cells, you create a flowchart that describes the relationship between, say, price, units

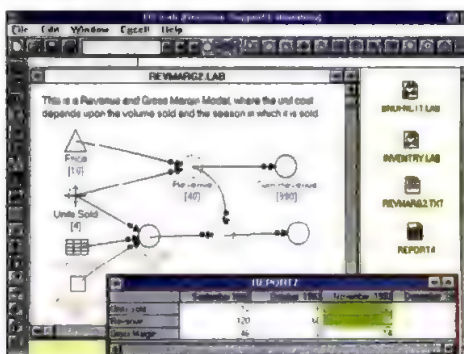
sold, and revenue. First, you draw the model (which can be edited) using tools from the toolbar. Then you define it mathematically, run the simulation, and finally report the results, which are stored in traditional spreadsheet formats such as Microsoft Excel's .XLS. You can print both the decision flowchart image and the traditional table. Initially, DS Lab will share information with other applications through Dynamic Link Libraries, but subsequent

versions of DS Lab are expected to support Microsoft's Object Linking and Embedding (OLE) 2.0. The DS Group also has plans to support multidimensional modeling in a future release.

The product will come in two versions. The \$995 DS Lab Pro is aimed at financial analysts,

actuaries, and other professionals who develop large, complex models. The \$195 entry-level DS Lab is for occasional spreadsheet users who, the DS Group is betting, will be more comfortable with the flowchart interface than the traditional spreadsheet's rows and columns of cells.

—Mary Kathleen Flynn



Flowchart provides front end to spreadsheet data.

57 IC



TECHNOLOGY
Selective
Best

Shopping For A
New Computer?

ZEOS[®] Has Two
Words Of Advice/2E

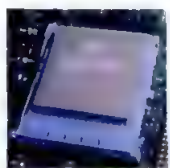


WEDNESDAY / J



HAVE SOME QUESTIONS ABOUT BUYING A COMPUTER? JUST ASK ZEOS!

Q. How can I make sure I'm getting a computer that won't be obsolete next year?



A. Make sure you're getting more than just an OverDrive socket for your CPU. You want a computer

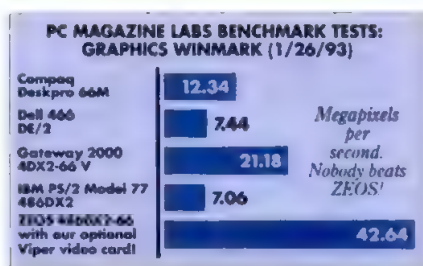
that you can *upgrade to Pentium-level technology*. With ZEOS upgradables, you're ready for the future...a Pentium future! And our Zero Insertion Force (ZIF) socket makes upgrading easy.

CPU upgradability is only part of the story. Check out the number of drive bays and open slots on the PC you want to buy. ZEOS gives you *six* bays, and eight slots—two of which are local bus!

Q. I want incredible speed. What should I look for?

A. For high-speed video that's upgradable with industry-standard graphic adapters, *you want a system that has VESA-standard local bus slots*. As we mentioned above, ZEOS gives you two of them. Our standard super-fast local bus SVGA card includes Windows acceleration, and if you want the video performance that PC Magazine said "blew all competitors away," choose our optional Viper video card. And, because you're getting the VESA standard, you won't get stuck with some proprietary architecture that's obsolete in 6 months. Demand

Demand



VESA standard with your system!

And for data transfer that's over twice as fast, get local bus IDE. It's the same fast local bus technology applied to the built-in IDE drive controller. ZEOS gives you performance *up to 225% that of ordinary IDE systems!*

Q. What's so important about SCSI? And Flash BIOS?



backups later, you need SCSI. ZEOS can add an extremely inexpensive (only \$49!) yet very high-performance SCSI option to your system without using an expansion slot. So you can run any SCSI options you desire—now or later.

Since optimum Pentium upgrades require changing the BIOS, we include FLASH ROM technology—so you can easily upgrade the BIOS through a diskette or modem.

A. If you want to add high-performance CD-ROM drives and tape

Q. How do I know I'm getting a high-quality system?

A. Look for a *high-quality motherboard*. ZEOS designs its own motherboard. Other vendors offer their "motherboard du jour," changing boards every time they find a cheaper supplier. By controlling the manufacture of this key component, ZEOS guarantees you'll get full use of your PC far into the future.

Look for *quality components*. Such as floppy drives by Teac.

Thick, strong cases with reinforced steel.

SVGA monitors with .28mm dot pitch that are non-interlaced all the way up to 1024x768 resolution. ZEOS gives you all of this—and more.

You want a system that can handle the speed that you demand. Today's high-performance CPUs can quickly turn into a space heater with a keyboard. Not with ZEOS. We ensure your system's long life with a few important extras: *a high-capacity power supply with built-in surge suppression, and twin cooling fans*. Because the cooler your system runs, the longer it will last.



Q. What other things should I look for when I buy a system?

A. First, UL Listing. Make sure it's on

More.

"This is a fast, beautifully designed PC with an upgrade path that just won't quit. That spells Best Buy to us."

—PC World,
2/93, Best Buy

"An array of features to make a user's mouth water."

—PC Magazine, 1/26/93

PCComputing

"Kudos for its excellent motherboard design, great performance, and thoughtful little extras... These features set the ZEOS apart from the crowd."

—PC/Computing, 3/93,
Best Value

Forbes

"ZEOS' engineering and quality advantages... clearly distinguish the ZEOS product from similarly priced machines."

—Forbes, 3/1/93



"The ZEOS is the fastest 33-MHz 486DX system we tested, and its performance even topped that of two 50-MHz 486DX2s."

—PC World, 2/93, Best Buy



"ZEOS's impressive new system grabs Windows by the throat and flings it across the screen with a sizzling new local bus graphics accelerator board parked in a local bus motherboard..."

—PC Sources, 4/93



"For a robust and upgradable high-performance system at an extremely competitive price, the ZEOS 486DX2-66 is an excellent choice."

—Windows Magazine, 5/93

"ZEOS's hot 486DX2 towers have Windows performance that will knock your socks off."

—Jim Seymour, PC Sources, 3/93



"The stand-out was the ZEOS 486DX2-66 system that blew all competitors away—in some cases performing more than ten times as fast as competitors."

—PC Magazine, 1/26/93

"ZEOS's thoughtful motherboard design—which includes a Pentium OverDrive-ready ZIF socket, plenty of space for full-height cards and an optional on-board SCSI interface—give it the advantage."

—Windows Magazine, 5/93

**ORDER NOW TOLL FREE
800-554-7172**

Fax Orders: 612-633-1325, Government:
800-245-2449, TDD Orders: 800-228-5839,
Outside U.S. and Canada: 612-633-6131.
MasterCard, VISA, Am Exp, Discover, Z-Card™
COD and Leasing programs.
Open 24 Hours a Day, 365 Days a Year!



CHOOSE FROM THESE FOUR MONEY-SAVING PACKAGES.

Or we can custom build a system to your exact specifications. And call us!

	#1	#2	#3	#4
486SX-25	\$1295	\$1795	\$2195	\$2495
486SX-33	1395	1895	2295	2595
486DX-33	1595	2095	2495	2795
486DX2-50	1695	2195	2595	2895
486DX2-66	1795	2295	2695	2995
Intel 486 CPU	■	■	■	■
ZIF upgrade socket	■	■	■	■
MB of RAM expandable to 64MB on motherboard	2	4	8	16
High-speed IDE hard drive (MB)	107	214	340	452
Built-in hard drive cache	32K	128K	128K	256K
Local bus IDE hard drive interface	■	■	■	■
Seek time (ms)	16	16	12	12
1.2MB Teac floppy drive	■	■	■	■
1.44MB Teac floppy drive	■	■	■	■
ZEOS 14" high-resolution mono VGA monitor	■	■	■	■
ZEOS 14" high-resolution 1024x768 non-interlaced SVGA monitor	■	■	■	■
Monitor dot pitch (mm)	.28	.28	.28	.28
1MB high-speed VESA local bus card with Windows accelerator	■	■	■	■
Eight expansion slots including two VESA local bus	■	■	■	■
Two serial ports, one parallel port	■	■	■	■
Shadow RAM/EMS support	■	■	■	■
Socket for optional on-board SCSI	■	■	■	■
Flash BIOS	■	■	■	■
High-capacity 200W power supply and built-in surge suppression	■	■	■	■
ZEOS SpaceSaver case with six drive bays	■	■	■	■
Two cooling fans	■	■	■	■
ZEOS 101-key tactile/click keyboard	■	■	■	■
Microsoft DOS 6.0 (plus enhanced tools)	■	■	■	■
Microsoft Windows	■	■	■	■
Microsoft Mouse	■	■	■	■
Choice of Lotus Improv, 1-2-3, Ami Pro or Freelance	■	■	■	■
Lotus Organizer	■	■	■	■
24-Hour-A-Day Toll-Free Technical Support	■	■	■	■
30-Day Money-Back Guarantee	■	■	■	■
One Year Limited Warranty	■	■	■	■

Advice

continued from page 4E

Plus, you're covered by our One Year Limited Warranty, Express Parts Replacement Policy and a complete ZEOS Customer Satisfaction Package.

And now there's FactFax!

Many technical questions can be answered by fax. And sometimes they need to be, so you can have a written document to refer to. Now you can call our special FactFax number. All you need is a fax and a push-button phone and we'll fax our answers back—fast!

Q. All of this must cost a lot...right?

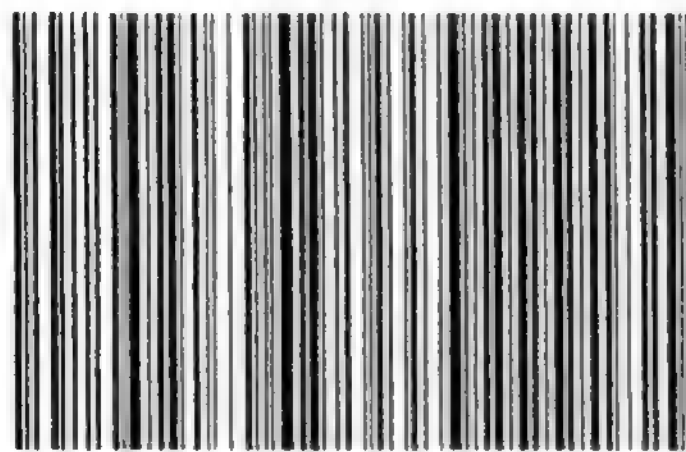
A. No way. Check out our prices. Shop around and compare systems. We think you'll agree: *Feature for feature, no one gives you as much as ZEOS. At any price!* And quite frankly, in the history of our company, we've never built better PCs than these. That means a lot coming from a company with nine *PC Magazine* Editors' Choice awards.

Q. So—how do I get a ZEOS system?

A. Just give us a call—toll free! We're open 24 hours a day, 365 days a year. A friendly and knowledgeable ZEOS Systems Consultant will be glad to answer your questions, help you pick a package, or tailor a system to your exact specifications. We know you'll agree: ZEOS is absolutely your best choice. And we don't just say it. We guarantee it!

**CALL NOW TOLL FREE
800-554-7172**

Inverted Foldout slip-sheet

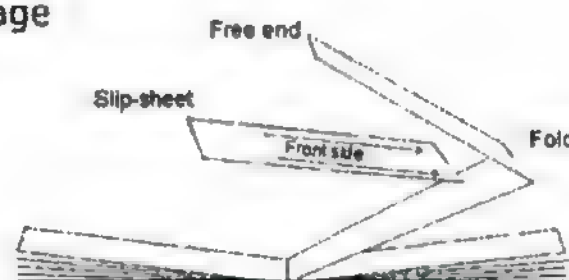


GbsSlipSheet-001

Folded edge of the page

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page

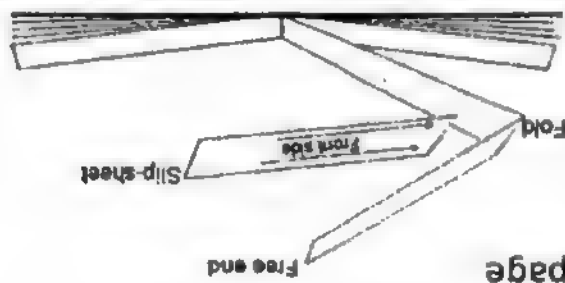
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

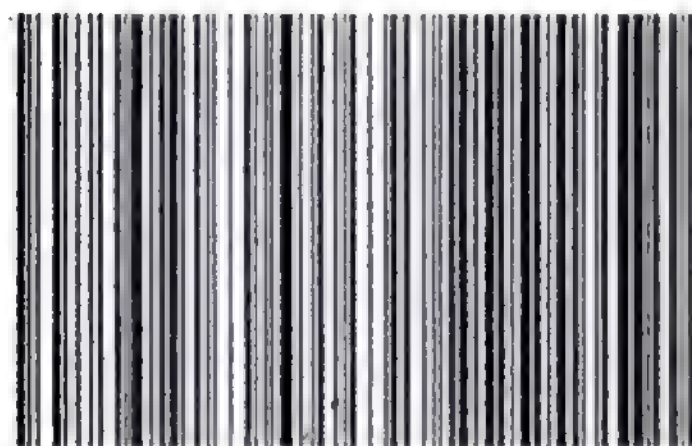
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-0018

Back

1. Follow instructions on the other side

ZEOS.®

the entire system, not just the power supply. It means your system has passed rigorous tests for safety and we think that it says something about quality, too.

Second, check out the software. Get more than just simple starter software with your system. Most ZEOS packages come with *everything you need* to get started: your choice between *two* spreadsheet programs (Lotus 1-2-3 for Windows or the exciting



new Lotus Improv), a word processing program (Ami Pro) or a presentation program (Freelance Graphics for Windows). That's in addition to Lotus Organizer, Windows, and DOS 6.0 with enhanced tools (the latest and greatest!). With all the free software you get with your ZEOS, you save hundreds of dollars!

Q. What happens if something goes wrong with my

system—or I have a question?

A. It never fails—the biggest questions come up when you're working late on something important. It's comforting to know that you can call ZEOS technical support, *toll-free, 24 hours a day, 365 days a year.* And better yet, it won't take six days to get past a busy signal.

Not that you'll probably need to call at all.

Time after time, ZEOS is named **PC Magazine Readers' Choice for Service and Reliability.** For both desktops and notebooks. So you can buy with confidence!



Q. What other kinds of after-the-sale support will you give me?

A. If you're not absolutely convinced your new ZEOS PC is everything we say it is and more, you have a full 30 days to return it to us for a complete refund. No questions asked.

Advice continued on 5E

Go with our fabulous 14" SVGA monitor, or upgrade to a 15" VESA-standard flat screen version for only \$95!

Our six-bay desktop case is great—or you can upgrade to our ten-bay vertical case for only \$95 more!



We Can Ship *Today*.



Call ZEOS Now!



A lot of computer companies are big on promises—but small on delivery. Not ZEOS. With our exclusive *Computers Now!*SM program, you can get same-day shipping on our most popular configurations—both desktops and notebooks! What's better, we guarantee to ship your system the same day you order—or we ship it at our expense!

HERE'S HOW IT WORKS:

Many, many popularly-configured ZEOS systems are pre-built and ready to ship. While supplies last, we'll ship your system to you the day you order subject to these conditions:

- 1.) Your order must be received by 1PM Central Time M-F.
- 2.) Credit cards are subject to authorization.
- 3.) Orders must be for ZEOS *Computers Now!* configurations. Call for details. Any other ZEOS systems and custom configurations take slightly longer.

OUR GUARANTEE TO YOU:

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it *at our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems are in stock, so give us a call to verify availability. This offer is limited to *Computers Now!* configurations.

So if you're tired of big promises and no delivery, then call ZEOS now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today. Guaranteed!

ORDER NOW TOLL FREE
800-554-7172

Fax Orders: 612-633-1325, Government: 800-245-2449, TDD Orders: 800-228-5389, Outside U.S. and Canada: 612-633-6131. MasterCard, VISA, Am Exp, Discover, Z-Card,SM COD and Leasing programs. Open 24 Hours a Day, 365 Days a Year!

Purchase orders from Fortune 1000 companies, governments and institutions subject to approval. Leasing programs available. All prices and specifications are subject to change without notice. Please call to confirm pricing, specifications and warranty details. All products and company names are trademarks or registered trademarks of their respective holders. ©1993 ZEOS International, Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company. (NASDAQ symbol: ZEOS). UPGRA-PCM-9306A.

Circle 151 on reader service card.

A. YOUR PERSONAL INFORMATION

Please complete all appropriate sections, *providing at least two years residence and employment history. THIS IS NOT A CREDIT AGREEMENT!* One will be sent to you upon authorization of an account. (This form must be signed to process your application.) All financed purchases are subject to credit approval. *If you have any credit questions, please call 800-421-8942 for assistance. Thank you!*

Name _____ Previous Address _____
Home Phone (____) _____ City _____ State _____ Zip _____
Soc. Sec. No. _____ Date of Birth _____ Employer _____ Since (Mo./Yr.) _____
Address _____ Apt. _____ Monthly Gross Salary \$ _____ Daytime Bus. Phone _____
City _____ State _____ Zip _____ Previous Employer _____ From _____ To _____
Since (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____ Occupation _____

A married person may apply for individual credit. I am applying for (please check appropriate box)

☐ **JOINT CREDIT** with another person. Complete entire application
☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application

☐ **INDIVIDUAL CREDIT.** Do not complete section C. **

** If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract

NOTICE TO WISCONSIN APPLICANTS:
YOU MUST DISCLOSE YOUR MARITAL STATUS
☐ married ☐ unmarried ☐ legally separated

Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation

Additional Monthly Income \$ _____ Source _____

Name & Address of Nearest Relative Not Living With You _____

Relationship _____

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE A

	Checking Account	☐ Yes ☐ No		Savings Account	☐ Yes ☐ No
	Y/N	How Many?		Y/N	How Many?
Bank Loan	_____	_____	Dept. Store Charge Card	_____	_____
VISA	_____	_____	Credit Union Account	_____	_____
MasterCard	_____	_____	Other Major Charge Cards	_____	_____
Finance Company Loan	_____	_____			

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____

Soc. Sec. No. _____ Date of Birth _____

Address _____ Apt. _____

City _____ State _____ Zip _____

Home Phone (____) _____ Date of Residence (Mo./Yr.) _____

Joint Applicant's Employer _____ Since (Mo./Yr.) _____

Bus. Phone (____) _____ Monthly Gross Salary \$ _____

CUSTOMER AUTHORIZATION

I authorize ZEOS International, Ltd. or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct to the best of my knowledge and belief

Applicant's Signature _____ Date _____

Joint Applicant's Signature _____ Date _____

FOR MARRIED WISCONSIN APPLICANTS: I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family

Buyer's Signature _____ Date _____

There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or write to ZEOS, Z-Card Processing Center, 1301 Industrial Blvd., Minneapolis, MN 55413

NY-A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report

OH-The Ohio laws against discrimination require that all creditors make credit equally available to all creditworthy customers and that credit reporting agencies maintain separate credit histories on each individual upon request. The Ohio Civil Rights Commission administers compliance with this law

* Financing not available in Alaska, Hawaii or outside the continental U.S.

ZCD-PCM-9306A

Z-CARD PRIORITY APPLICATION FAX NUMBER: 612-633-7507

Apply for your own Z-CardSM today!



Here's another great reason to buy a ZEOS system: the Z-CardSM! The Z-Card works just like a MasterCard or VISA—so you can charge your ZEOS purchases and pay in easy monthly installments. And since no down payment is required, it makes buying your new ZEOS system easier than ever!

You can apply for your very own Z-Card and low, low monthly payments right now. Simply fill out this application and fax it to 612-633-7507. Or mail it to ZEOS International, Z-Card Processing Center, 1301 Industrial Blvd., Minneapolis, MN 55413. We'll contact you as soon as your credit line is established, usually within 24 hours of receipt. Apply today!

The only notebook with a tilt & swivel display. Great for sharing data or keeping it private. Easily adjusts for perfect viewing.



This fine Italian leather carrying case is an additional option. Loaded with pockets and features everyone will appreciate.



Digital brightness and contrast buttons make screen adjustment so easy.

Incredible ZEOS® Notebook. Incredible Price: \$1295!

THE ZEOS FREESTYLE/SL. NOW MORE AFFORDABLE THAN EVER!

To try and compare the new ZEOS Freestyle/SL to any other notebook is next to impossible. Because nothing else has all its features. And even with all these great features, nobody can match its incredible new price. Features and price. It would seem the new ZEOS Freestyle/SL is the best of all worlds. It is.

DESIGNED BY USERS. JUST LIKE YOU!

We asked our customers what it is they want in the perfect notebook. The first thing they told us is that most notebooks look like a cigar box with a lid. They told us they wanted not only good looks, but things like great power *and* great battery life. Lightweight too, like five pounds and change. And the keyboard should be effortless to use. The entire product had to be extremely durable. And that was just for starters.

SL POWER. SL BATTERY LIFE. 64K CACHE!

We listened well. Then we got down to work. For the chipset and CPU we selected the Intel 25MHz SL. We then built in a high-speed 64K SRAM cache as standard. We know this system might well replace a desktop for many users.

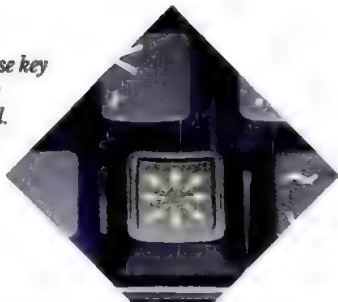
And power to your ZEOS Freestyle/SL system is provided by our advanced battery system. The fully enclosed lightweight battery packs easily snap in and out and can be "quick-charged" when the system is not being used, or trickle-charged when in use. So what happens when the power is on?



GREAT VIDEO TOO.

You get great video! Because for video control, we chose the amazing new Cirrus Logic VGA controller. It not only consumes less power, it also produces the fast crisp images you're looking for. And with a business machine like this you'll also appreciate our dual display capabilities. You can connect an external VGA color monitor for simultaneous display. And that's not all.

Built-in mouse key provides easy cursor control. Leave those bulky mice behind!



This sliding port door won't break off or come loose. Saves your fingers, too.



BUY WITH CONFIDENCE. ZEOS was voted PC Magazine's Readers' Choice for Service & Reliability for both our desktop and notebook systems!

A NOTEBOOK KEYBOARD YOU'RE GOING TO LOVE.

We re-designed and re-sculpted every key from scratch. Even the key-switch mechanism was invented anew. And we added the mouse key for easy cursor control. It is the absolute perfect notebook keyboard. What else?

Lots else! Like the best display system of any notebook available anywhere. We listened here too. The screen is big and easy to read. Plus, it's high contrast and it's fast. It's also very easy to adjust. People said contrast and brightness knobs were hard to use. So we replaced them with soft touch buttons that *electronically* adjust screen settings at your command. Then we really got creative.

THE ONLY NOTEBOOK WITH A TILT & SWIVEL DISPLAY.

Can you imagine your desktop PC without a tilt and swivel display? Neither could we. So why not incorporate that feature into a notebook. With the ZEOS Freestyle/SL notebook you can adjust the screen left and right as well as tilt it up and down. Now you can truly adjust your notebook screen to the perfect viewing angle.

IT FLOATS TOO.

And then there is the "floating" screen. When you're facing your new ZEOS Freestyle/SL, the screen actually appears to "float" in the air in front of you. It's the only notebook that can really be used sitting on your lap!

EXTRA, EXTRA, EXTRAS. READ ALL ABOUT 'EM!

We've made more options available than ever before. Like our modem with send/receive fax. And memory up to 20MB, hard drives to 180MB, even an optional Italian leather carrying case! Extra batteries and a charging stand are available too. Call 800-554-7172 for all the details.

ZEOS. READER'S CHOICE FOR SERVICE AND RELIABILITY.

According to *PC Magazine's* February 9, 1993 Service and Reliability issue, ZEOS was the only vendor to rate "Excellent" for service and reliability. For both notebooks *and* desktops! Our customers vouch for our high standards, so you can buy with confidence.

What's better, ZEOS technical support is 24 hours a day, 365 days a year and toll free. And we back your new ZEOS Freestyle with our 30-Day Absolute Satisfaction Money-Back Guarantee, One Year Limited Warranty and more.

ORDER YOUR ZEOS FREESTYLE NOW.

Many of our most popular Freestyle packages are available for same-day shipping. Just call for all the details. A friendly ZEOS Consultant is ready to answer any questions you may have. You're going to love your new ZEOS Freestyle notebook. Why not give us a call right now!

CALL NOW TOLL FREE:
800-554-7172

Purchase orders from Fortune 1000 companies, governments and institutions are subject to approval. Leasing programs are available. All prices and specifications are subject to change without notice. Please call to confirm pricing, specifications and warranty details. All products and company names are trademarks or registered trademarks of their respective holders. © 1993, ZEOS International, Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS).

CIRCLE 063 ON READER SERVICE CARD

ZEOS FREESTYLE/SL PACKAGE #1:

ONLY \$1295

- Intel 25MHz 386SL, 64K cache
- 2MB RAM standard, expandable to 20MB.
- 60MB hard drive, 3.5" floppy.
- Backlit 10" VGA display with tilt/swivel base. Simultaneous display with external VGA monitor.
- Snap-in and -out battery packs provide for 3-4 hours of typical operation.
- Quick-charge in little over an hour with the small lightweight AC adapter.
- 8.5" x 11.3", 5.6 lbs., built-in soft carrying handle.
- 81-key keyboard with built-in full-size inverted "T" arrow keys.
- Serial, parallel and VGA ports with standard connectors protected by a durable, easy-to-use sliding door. No more broken doors or broken fingernails!
- Includes MS-DOS!
- 30-Day Money-Back Guarantee, complete ZEOS Customer Satisfaction Package.
- 24-Hour-a-Day Toll-Free Technical Support, 365 Days a Year.

PACKAGE #2:

ONLY \$1795

- 6MB RAM.
- 120MB hard drive.
- Custom-fitted nylon carrying case.
- MS-DOS and Windows!

PACKAGE #3:

ONLY \$2295

- 10MB RAM.
- 180MB hard drive.
- Custom-fitted nylon carrying case, extra battery, external charging stand.
- MS-DOS and Windows.
- 2400 bps modem with 9600 bps send and receive fax!

ORDER NOW TOLL FREE:

800-554-7172

Fax Orders: 612-633-1325
Government: 800-245-2449
Hearing Impaired (TDD)
Orders: 800-228-5389
Outside US and Canada:
612-633-6131
MasterCard, Visa, Discover,
Am Exp, Z-Card™
Open 24 Hours a Day,
365 Days a Year!





The Colorado Jumbo Tape Drive. Available in 120MB and 250 MB capacities

Look for these signs when going for a drive.

These signs mean you're headed for the best value in tape backup. Now, the world's most popular mini-data cartridge backup system, Jumbo 120[®] is only **\$199** MSRP. And for your higher capacity needs, Jumbo 250[®] is a remarkable **\$279** MSRP. Both drives include the new Colorado Backup software, at no additional cost.

These new low prices make Jumbo the affordable backup solution for practically any home or office PC system! And that means better data protection for everything you do on your computer.



Jumbo Tape Drives are easy to install and, at up to 9.3 MB/min. (Jumbo 250), easily the fastest in their class. Both are compatible with most popular networks, including Novell[®] NetWare[®] and LANtastic[®]. In addition, both offer support for UNIX[®]/XENIX[®] and OS/2[®]. And you get the added security of Industry-Standard QIC Recording Format.

With their high reliability, dozens of awards and new low prices, all signs point to Jumbo for the better backup solution. Call **1-800-451-0897**, ext. 112 today for a free 76-page catalog, or visit your nearest dealer. Drive safely.



Colorado
Jumbo
TAPE BACKUP SYSTEMS

© 1991 Colorado Memory Systems Inc. All rights reserved. Jumbo is a registered trademark of Colorado Memory Systems Inc. All other trademarks are property of their respective companies. DCA P33011/91

First Looks

HANDS-ON EVALUATIONS OF THE NEWEST SHIPPING PRODUCTS

■ The Shape of Things to Come

Pentium Preview: Vendors Supply Five Prototypes

BY OLIVER RIST

Clamoring for your first Pentium? So was *PC Magazine*. Unwilling to wait until the processor's May 15 release date, we got our hands on five prototype Pentium-based systems.

Though the prices and performances are still unofficial (Intel embargoed our reporting specific test results before the chip's official debut), this early glimpse at PCs from ALR, Compaq, Digital, and Hewlett-Packard shows that a Pentium PC promises almost double the throughput of a 66-MHz

486DX2, but at a substantial price premium.

Initial tests show that a 66-MHz Pentium-based system has throughput between 1.8 and 2 times greater than a 66-MHz 486DX2-based system. These results were obtained using regular integer-based, not floating-point, code. New compilers, optimized for the Pentium's improved floating-point abilities, may show an even greater speed difference.

Our preview also helped us draw some general conclusions about what it takes to make Intel's new silicon soar. Fast

memory and secondary cache subsystems are essential in order to reap the benefits of this new technology. The fastest machines we saw used 128-bit paths to memory and 64-bit paths to the secondary cache. Advanced bus architectures and high-speed I/O subsystems will also play a large role in giving the Pentium a real workout.

As is often the case with new processor types, Pentium units are expected to be in short sup-



MAMMOTH: Evolution V's giant chassis.

ply initially. If you need the fastest PC available now and can afford the price premium, look for a system that uses the wide data path and advanced memory and cache architectures. Shop carefully.

Continues on page 38

■ Special Report

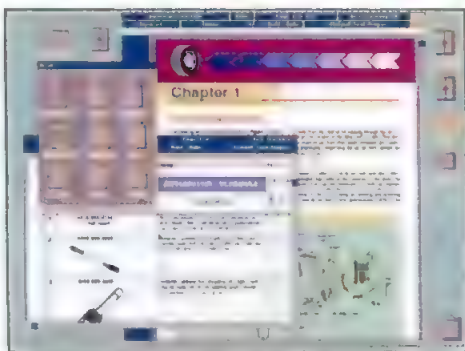
Gearing Up for 32-Bit Applications

BY CAROL LEVIN

If you are wondering when Windows NT versions of the applications you run every day will be available, you are not alone. So are the developers! While there is a groundswell of support for Windows NT from software developers, most are waiting until NT is on the street to test for stability. This issue takes a look at Windows NT—Microsoft's new 32-bit operating system—but a quick survey of the apps landscape says not to expect much until three to six months after Windows NT ships.

The good news is that you

don't need the recommended 12MB of RAM, or even NT itself, to run the next generation of fast 32-bit programs. To lever-



32-BIT DTP: Interleaf for DOS, Unix, and NT.

age the existing corps of Windows 3.1 users, Microsoft developed an application pro-

gramming interface (API) called Win32s, a subset of the larger Win32 API, that enables software makers to build 32-bit programs that run on top of 16-bit Windows (see the sidebar "Thinking: Running 32-bit Apps Without NT").

The big story here is performance, plain and simple. While some developers report speed increases of 100 percent over 16-bit programs, not all applications will benefit equally from being 32-bit. Spreadsheets and word processors show more modest speed improvements than graphics and computer-intensive applications.

Software development tools are expected to hit the market first. Borland C++ for Win32 and a 32-bit version of Microsoft Visual C++ are slated to ship within three months of NT. Symantec's compiler, Zortech C++ for Windows NT, has been available since February, and the Watcom C/C++³² compiler, which exploits the Pentium

Continues on page 42

► IN FIRST LOOKS

Microsoft Mouse.....	44
SuperMatch Spectrum/24....	44
The Norton Utilities 7.0.....	46
HP100LX.....	48
Listen for Windows 1.0.....	49
Authorware Professional for Windows 2.0.....	50
Lotus Notes, Release 3.0.....	52
pcAnywhere 1.0 for Windows.....	53
StrataVision 3d PC 1.0.....	56

First Looks

Pentium

CONTINUED FROM PAGE 37

ALR Evolution V

ALR's vision of the perfect Pentium server entails upscale evolution: The Evolution V is a mammoth. It's almost wide enough to be called a double tower case, holds as many as 15 drives, and supports as much as a gigabyte of RAM. With memory and data paths wide enough to support the new chip, the Evolution V becomes an excellent file server with lightning-fast performance potential.

ALR has unveiled its new QuadFlex architecture for this model. A custom ASIC allows the Evolution V to send data from the CPU to the external cache along a 64-bit data path, and from the external write-back cache to memory along a 128-bit path. At this point this design supports a single processor, and ALR says there are no plans for the Evolution V to support dual Pentium processors.

The Evolution V's motherboard is gargantuan but provides plenty of upgrade potential in return. Amazingly, this system supports almost as much RAM as it does storage: 1GB if you fill all 16 memory sockets with PS/2-style, 64MB SIMMs. The system uses a 512K secondary cache and provides up to 1.2GB of SCSI hard disk storage.

The Evolution V contains ten 32-bit EISA expansion slots (six are bus masters) and three VESA local-bus slots. Though most file servers don't need it, the prototype we examined contained a VESA-compliant ATI local-bus video controller. ALR says the slots themselves add almost no cost to the system and may add functionality in the future, whether from video or a high-end drive controller. When the Fast EISA-2 specification is approved, ALR says the Evolution will be further upgraded in response.

Despite the roomy mother-

board, ALR placed the keyboard controller, serial, and parallel circuitry on an expansion card. Nevertheless, there are plenty of expansion slots left, and ALR said that this approach allows for overall smoother system performance.

ALR redesigned the Evolution V's outside, too. The case's flat-black color is attractive and modern, and the huge chassis allows for easy access to all system components. However, the motherboard and drive bays each need to be accessed from opposite sides of the case and neither side is on hinges; both need to be unscrewed. On the other hand, five internal fans ensure that your Pentium remains cool and collected, and the fault-tolerant 450-watt power supplies will help stave off disasters as well.

For the time being, ALR says the product will be supported by its standard, one-year parts-and-labor warranty with a \$9.95 service charge for on-site service.

The combination of a Pentium processor and ALR's QuadFlex architecture has the power to make the muscle-bound Evolution scream.

• List price: *ALR Evolution V, with 16MB RAM, 1GB hard disk, SuperVGA video, price to be announced.* Advanced Logic Research Inc., 9401 Jeronimo Rd., Irvine, CA 92718; 800-444-4257, 714-581-6770; fax, 714-581-9240.

Circle 420 on reader service card

ALR ProVEISA

ALR's upgradable ProVEISA has been described as an average, competitively priced, 486-based file server. But though the ProVEISA is certainly price-worthy, it's not cheap enough for its present users to throw it out and purchase ALR's new Evolution V, a system that's been



UPGRADE: Pentium extends ProVEISA.

owners happy, ALR has designed a Pentium processor upgrade module. The module requires both a proprietary slot and one standard ISA slot on the ProVEISA's ten-slot motherboard. The proprietary connection allows communication with the rest of the system, and the ISA connection powers and grounds the unit.

The upgrade module is packed with 512K of secondary cache, the clock crystal, and some discrete logic to help take advantage of the read/write-back memory features contained in the new processor.

Though its discrete-logic components should help a little, you'll still be running slower

optimized for the Pentium processor.

To keep today's ProVEISA

SUMMARY OF FEATURES

Pentium Systems

Products listed in alphabetical order

	ALR Evolution V
■ = YES □ = NO	
List price (16MB RAM, 1GB hard disk)	TBA
Case style	Tower
Bus architecture	EISA
Watts, number of connectors	450, 14
Motherboard and CPU	
Chip set manufacturer	ALR, Intel
Processor location	Motherboard
Processor-to-cache data path	64-bit
Cache-to-memory data path	128-bit
Flash memory BIOS upgrade	■
Memory and RAM Cache	
Installable RAM	4MB-1GB
External processor RAM cache	512K
Cache architecture	Direct-mapped
Cache write policy	Write-back
Disk Drives	
Front-accessible drive bays (5.25", 3.5")	13, 2
Internal drive bays (5.25", 3.5")	0, 0
Floppy disk drives	1.44MB
Hard disk options	340MB-1.2GB
Disk controller location	ISA card
Expansion Bus	
16-bit, 32-bit slots	0, 10
VESA, PCI, proprietary local-bus slots	3, 0, 1
Parallel, serial, mouse ports	1, 2, 1
Video	
Display circuitry location	Local-bus card (optional)
Video chip set manufacturer	ATI
TBA-To be announced	

First Looks

than you would with true Pentium power, since the system has to funnel the processor's 64-bit path potential down into a 32-bit data bus.

The prototype upgrade board we examined had wires hanging all over it, but still auto-configured as promised and ran the 60-MHz Pentium without difficulty; you don't even have to run EISA configuration.

Like other systems in the ProVEISA line, a typical metal tower case (complete with U-shaped metal cover held in place by screws) provides a case lock and a front panel lock. The plastic door protects your power and reset switches from unwelcome or unskilled fingers. There's also

room for 12 drives, and the system sports two fans. To adjust to the blistering heat a Pentium generates, ALR covered the silicon with a heat sink and a dedicated processor fan. This fan is also hooked to a thermal sensor that measures the silicon's heat level and increases or decreases the fan speed in response.

The rest of the system stands as it always did: Eight 32-bit EISA expansion slots combine with two 16-bit ISA slots, up to 256MB of RAM, and a maximum of 535MB of hard disk storage. ATI's UltraPro EISA video board with 2MB of VRAM is hooked to a monitor capable of only 800-by-600 resolution.

ALR has promised numerous software upgrades designed to make the ProVEISA much more competitive as a file server. Improvements include fault prevention and tolerance features, as well as a serious upgrading to internal security.

ProVEISA users won't experience the chip's full power, since the system was originally designed as a 486. For full Pentium computing under the ALR flag, you need QuadFlex architecture; right now, that's only in the Evolution V. Still, the Pentium module will help ALR's existing ProVEISA customers extend the life of their computers.

• List price: *ALR ProVEISA, with 16MB RAM, 1GB hard disk, \$6,000 to \$7000. Advanced Logic Research Inc., 9401 Jeronimo Rd., Irvine, CA 92718, 800-444-4257, 714-581-6770; fax, 714-581-9240.*

Circle 421 on reader service card

Compaq Deskpro 5/66M

Compaq's news isn't so much about a system as it is about a processor upgrade board—but that's also what makes this implementation shine. Compaq didn't design a whole new system around the Pentium. It came out with a truly awesome upgrade board whose prototype outperformed just about everyone else's, even when plugged into a PC the user could already own.

Inside the Deskpro 5/66M's excellently finished case, the motherboard carries a separate section (containing system BIOS, I/O ports, and Business Audio) that easily slides out for no-headache BIOS upgrades, plenty of VLSI circuitry, and six bus-mastering EISA expansion slots that can all hold full-length cards. The

processor and memory expansion slots are proprietary, with only the memory slot potentially crowding the processor. This minor flaw is rendered moot with the Pentium module, since that processor card is designed to hold all system memory up to 136MB.

Compaq's Tri-Flex architecture shows that the Deskpro was designed with Pentium in mind. Much touted in previous reviews, this architecture helped make the Deskpro/M a relatively pricey 486. Now, however, it's allowed Compaq to be the only vendor we've seen to fully implement a four-way 32-bit interleaved data path from memory to its Tri-Flex controller, for an effective throughput of 128 bits. From the Tri-Flex controller, data can speed to the Pentium on a true 64-bit data path and also to the external 256K cache (perched on the processor board as an optional daughtercard) at the same pace. The cache also talks directly to the Pentium, again at 64 bits.

Taking a cue from the Pentium, which supports error-checking of the CPU's internal 16K cache, Compaq built in error-checking for the external cache as well.

Video provided Compaq's



WINNER: Tri-Flex architecture pays off.

usually excellent results—meaning its EISA-based QVision video card. This time, though the card turned in consistent scores comparable to many local-bus

Continues on page 40

ALR ProVEISA	Compaq Deskpro 5/66M	DEC 560ST Pentium	HP NetServer LM
\$66,000-\$7,000	Under \$11,000	TBA	\$8,086
Tower	Desktop	Mini-tower	Tower
EISA	EISA	EISA	EISA
300,6	240,4	254,6	396,9
ALR, Intel	Compaq, LSI Logic, Motorola	Intel	Intel
CPU module	CPU module	CPU module	CPU module
64-bit	64-bit	64-bit	64-bit
32-bit	64-bit 128-bit	32-bit	32-bit
■	□	■	■
4MB-256MB	8MB-136MB	4MB-192MB	2MB-384MB
512K	256K	256K	256K
Direct-mapped	Direct-mapped	Two-way set-associative	Two-way set-associative
Write-back	Write-through	Write-back	Write-back
5, 0	3, 0	3, 1	8, 1
1, 6	0, 1	1, 0	0, 0
1.44MB	1.44MB	1.44MB	1.44MB
200MB-535MB	240MB-510MB	127MB-1.0GB	530MB-1.0GB
Motherboard	Motherboard	EISA card	EISA card
2, 8	0, 5	0, 6	0, 8
0, 0, 0	0, 0, 2	0, 0, 1	0, 0, 1
1, 2, 1	1, 2, 1	1, 2, 1	1, 2, 1
EISA card	EISA card	ISA card	Motherboard
ATI Texas Instruments	Compaq	S3	Western Digital

First Looks

Pentium

CONTINUED FROM PAGE 39

designs, Compaq also sent us its new QVision 20-inch monitor. This is an excellent piece of equipment, with a brilliant flat screen managed by digital, front-mounted image controls. The low-emission monitor also features BNC-5 connectors and supports very high refresh rates—76 Hz at 1,024-by-768 resolution. Compaq is also introducing a QVision videocard that supports 1,280-by-1,024 resolution at equally high refresh rates and with comparable speed.

Compaq is also showing Pentium-based SystemPro and Deskpro/I products. Owners of the SystemPro XL will be able to plug in a new processor card, much like owners of present Deskpro/M 486-based models can, to get Pentium power. Though the SystemPro should support dual Pen-

tium chips fairly soon, those interested in multiprocessing on a Deskpro will apparently have to wait until late 1993 or early 1994.

The Deskpro/I product is not based around a processor plug-in card, so customers interested in that model can plan on buying a new system.

• List price: *Compaq Deskpro 5/66M, with 16MB RAM, 1GB hard disk, 20-inch QVision monitor, under \$11,000. Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269-2000; 800-345-1518, 713-370-0670; fax, 713-378-1443.*

Circle 422 on reader service card

DEC 560ST Pentium

Like ALR, Digital Equipment Corp. has added a Pentium upgrade module to its ST series to augment a product line not

originally designed to support the chip. Instead, the DEC 560ST Pentium relies on Intel's XPress bus architecture to provide adequate performance—better than a 486, but perhaps not as fast as a system with wider data paths.

XPress provides only a 32-bit interface to memory and a 64-bit path to the secondary cache; by comparison, Compaq's Tri-Flex and ALR's QuadFlex architectures provide a 128-bit path to the cache, a 64-bit path to memory, and a 32-bit path to the rest of the data bus.

Even more surprising, XPress runs its memory bus at



XPRESS® 64-bit data path suffices for now.

only half speed—33 MHz in the case of a 66-MHz Pentium. This may cause significant slowdowns on secondary cache misses.

On the other hand, adequate Pentium performance is all any server needs right now. With Pentium-optimized software still months away, networks will function just fine on an average Pentium for some time. And the 560ST will still blow the doors off a 486.

The rest of the ST is well configured for file server applications—particularly Novell's NetWare. The ST supports a maximum of 384MB of RAM (using 32MB SIMMs) and has a variety of hard disk options, from 127MB to a gigabyte. Its slightly smaller-than-average tower case is built like a tank, complete with radio-frequency shielding and solid case construct supports. A 300-watt power supply pumps juice to the unit,

and external security is left to two key locks and numerous software protectors.

The 560ST comes with a one-year parts-and-labor warranty, complete with on-site service.

• List price: *DEC 560ST Pentium, with 16MB RAM, 1GB hard disk, SuperVGA display, price to be announced. Digital Equipment Corp., Personal Computer Business Unit, 50 Nagog Park, Acton, MA 01720; 800-344-4825, 508-493-5111; fax, 800-234-2298.*

Circle 423 on reader service card

HP NetServer LM

Hewlett-Packard decided not to attach the Vectra name to its first Pentium system. That's a fitting move, because the NetServer LM's hulking tower box bears no family resemblance to the rest of HP's PC-compatible line.

Almost square in appearance, the NetServer LM's case provides room for nine drives and a 396-watt power supply. We were a little disappointed by the lack of doors, but HP will provide thumbscrews on the panels for the shipping version.

Like Digital Equipment Corp., HP uses Intel's Xpress bus architecture. As a result, the



NEW NAME: HP's Pentium server abandons the Vectra label.

motherboard is a little disappointing. Though it does support EISA (with eight expansion slots plus one proprietary slot for the CPU module), the architecture opens only a 64-bit data path to memory, and it runs the memory bus at half speed (30

MHz for a 60-MHz Pentium; 33 MHz when the 66-MHz model ships).

On the bright side, company representatives say the NetServer should ship with the new Fast EISA specification, when the spec is approved in June. This enhancement will speed up the I/O bus, though it will not affect the memory.

For now the NetServer LM may be slower than some Pentium implementations, but it's certainly got the muscle to be a NetWare server. The NetServer takes a maximum of 256MB of RAM (or 348MB with special SIMM sticks), which can be changed to ECC memory as an option. The system works in conjunction with a 256K secondary cache.

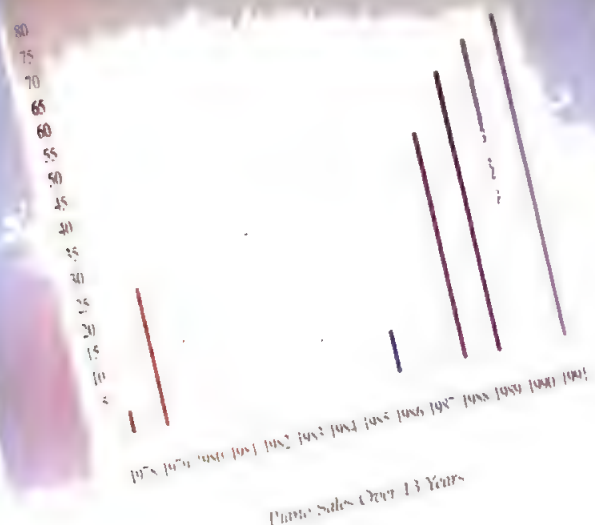
For storage, the NetServer LM includes internal SCSI and has an 8GB drive array option. HP hopes to complement this with an additional 10GB in an external array. Since these products aren't ready yet, the prototype unit we examined was configured with only an UltraStor controller and a pair of 535MB Seagate SCSI-2 hard disks.

HP's plans for the Pentium line are impressive. Dual-Pentium-capable units are coming soon, and the product will ship with a new three-year worldwide on-site service warranty. You'll also find Hewlett-Packard's NetServer Assistant server management software (an OpenView application) bundled, and the unit will be certified for any major NOS.

• List price: *HP NetServer LM, with 60-MHz processor, 16MB of RAM, 1GB hard disk, SuperVGA display, \$8,086. Hewlett-Packard Co., 3000 Hanover St., Palo Alto, CA 94304; 800-752-0900, 415-857-1501.*

Circle 424 on reader service card

Identical Output?



Ink Jet Printer



Primera™
COLOR PRINTER

Only
\$995



Obviously not! But both overhead transparencies were produced by printers with the identical list price of \$995.* Both had the identical print time and both had the identical cost per page. But the output quality is certainly not identical! The one on the left was printed by a popular, low priced ink jet color printer. The one on the right was printed by FARGO's® new Primera Color Printer.

Primera uses a wax thermal-transfer printing process, designed to print brilliant, full-page color graphics on transparency film. And it does the same great job on paper. Wrinkle-free!

Adding really great color to your presentations is now easier and more affordable than ever. For more information and the name of your nearest FARGO dealer, call 1-800-258-2974.

See us at Comdex, East Hall, booth #814

FARGO
ELECTRONICS, INCORPORATED

7901 Flying Cloud Drive
Eden Prairie, MN 55344 U.S.A.

1-800-258-2974

612-941-9470

Ext. 600

FAX: 612-941-7836

Primera is a trademark and FARGO is a registered trademark of FARGO Electronics, Incorporated. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation. © 1993 FARGO Electronics, Incorporated. *Suggested U.S. Retail Price.

CIRCLE 142 ON READER SERVICE CARD



First Looks

Windows NT

CONTINUED FROM PAGE 37

chip's ability to process multiple instructions at once, is now available.

WHAT'S IN IT FOR YOU?

Thirty-two bit technology is not really all that new, especially for developers of Unix and OS/2 software.

AimTech's Icon Author, for example, is a multimedia authoring tool that currently runs on Unix and Windows. The Win32s version in development will enable computer-based training applications to run faster.

Creative Systems Programming is bringing Golden Compass, an OS/2 communications program that automates access to CompuServe forums, libraries, and mail, over to NT. The new version will offer multithreading so users can download messages from one forum and simultaneously respond to messages from another forum.

Frame Technology's desktop publishing program, FrameMaker 3.0 for Windows NT, shows a 30 to 40 percent increase in performance over the current Windows version. Moving to NT is a natural transition for FrameMaker, which is already available as a 32-bit Unix application.

Great Plains Software's Dynamics, a new LAN accounting package for Windows and Macintosh, will be available in a 32-bit version for Windows 3.1. Benefits will include faster reports and faster posting. A later version will take advantage of NT's multithreading and preemptive (not just cooperative) multitasking.

Image-In, an early adopter of NT technology, expects NT to validate desktop color work, which has traditionally been slow and cumbersome. It reports that Image-In Color Professional for NT, a high-end image editing package, runs at twice the speed of the current Windows 3.1 version. This performance boost is due to NT's flat

memory model, which doesn't require an image to be paged through memory.

Interleaf's advanced electronic publishing system already runs in Unix environments and in extended 32-bit DOS environments. Prior to a full NT implementation that will exploit

Lotus Notes server that will take advantage of NT's symmetric multiprocessing. Lotus expects it to be available shortly after NT ships.

MathSoft's Mathcad 4.0 is now available with Win32s libraries that double the speed of this mathematical package,



IN THE WINGS: Faster 3-D rendering with 32-bit Typestry.

multithreading for intensive background computation, the forthcoming Windows 3.1 version will include Win32s dynamic link libraries (DLLs) so that users can develop their own 32-bit Interleaf applications.

Lotus is developing a 32-bit

allow manipulation of large vectors, and eliminate the 16-bit limit on array size.

Micrografx plans to migrate its entire line of graphics applications, including Designer, to 32-bit architecture. Since its programs do a lot of coordinate

transformations, early testing shows speed gains of at least 100 percent over 16-bit counterparts.

Microsoft's desktop applications—Excel, PowerPoint, Project, and Word—are slated for conversion to NT over the next year. Two of these programs should be available by year's end, the rest in 1994. Since they'll be full NT applications (not Win32s), you won't be able to run them in 32-bit mode under Windows 3.1.

Pioneer Software's Q+E for Windows NT, a query and reporting tool for client server environments, will take advantage of true multitasking. Acting like two computers running at once, your machine won't lock up when chewing on a database query that takes 10 minutes.

Pixar, maker of advanced 3-D rendering software, originally developed the CPU-intensive Renderman in 32-bit mode for Unix and plans to make it available for Windows 3.1 and Windows NT. It also expects to make Typestry, a program that renders 3-D pictures from type, The real benefits will show up under NT, though, where multithreading will enable you to render an image in the background without tying up your machine.

■ "Thinking": Running 32-bit Apps Without NT

The next software upgrade you buy may be a speedy 32-bit program that runs in Windows 3.1, a major beneficiary of Windows NT technology. Microsoft has developed an enabling technology called Win32s that gives software makers the ability to build a single 32-bit application that works on both existing Windows 3.1 desktops and on Windows NT. Win32s is part of Microsoft's strategy to deploy 32-bit applications quickly without making users wait for their organizations to convert to NT.

Win32s is a subset of the full-blown Win32 API (application programming interface) that's used to build Windows NT applications.

Included in Microsoft's Software Development Kit for Windows NT, Win32s is a set of dynamic link libraries (DLLs) and virtual device drivers (VxDs) that run 32-bit applications in 16-bit Windows. The 32-bit calls are converted, or thunked, from a flat 386 memory address mod-

ule down to a segmented 16-bit model. Think of it as shifting your car into a lower gear.

Microsoft says, however, that applications developed specifically for Windows NT will benefit from optimal speed gains. Also, server applications, such as communication gateways and database servers, will need the extra power of multithreading and security that only the full-blown Win32 API provides.

Win32s Conceptual Architecture



Source: Microsoft

Beauty And dBASE.

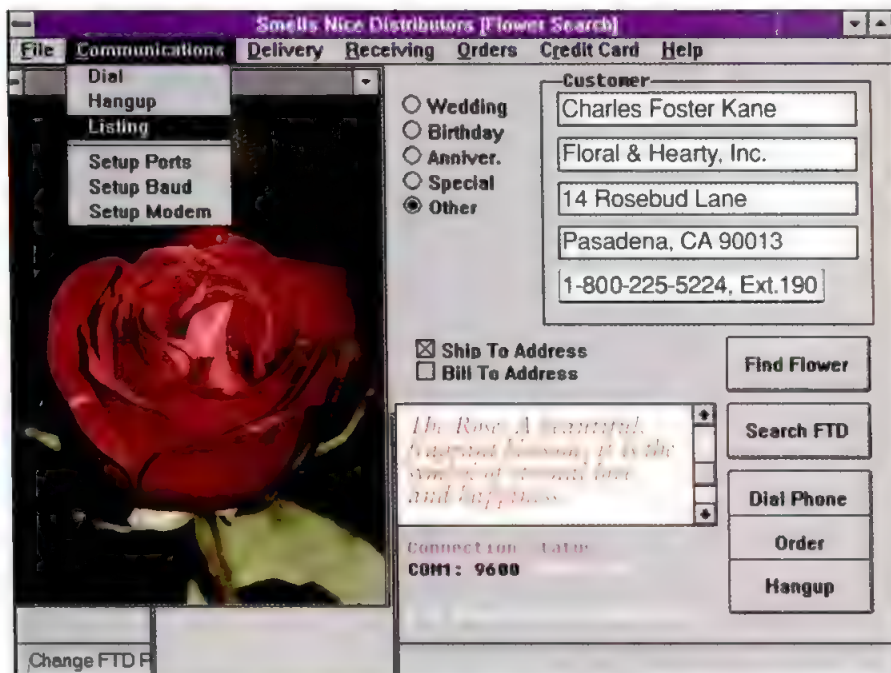


For millions of dBASE developers, this is a fairy tale come

true: new CA-dBFast 2.0, the first and only dBASE-compatible database and language for Windows.

CA-dBFast meets two giant needs: moving existing dBASE applications to Windows and developing dazzling new applications in record time. It's the one solution that lets you take advantage of Windows while protecting the huge investment you've made in Xbase technology.

With CA-dBFast 2.0, you get a proven, stable environment that's more visual and more intuitive than anything you've ever used. And there's no need for Microsoft's confusing, intimidating SDK, so creating applications with CA-dBFast is - true to its name - fast.



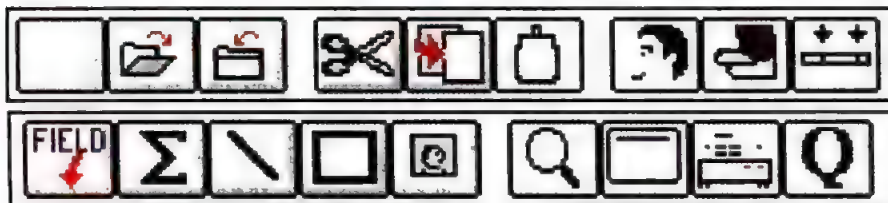
CA-dBFast includes Windows interface objects for pull-down menus, push buttons, radio buttons, check boxes, scrolling list boxes, bit-mapped graphics and more.

debugger that's so advanced it lets you watch your source code execute at run time - even Single Step through execution.

FOR A FREE DEMO DISK, CALL 1-800 CALL CAI, Ext. 190. With CA-dBFast applications, there are no license fees, royalties or key diskettes to bother with. And recipients of runtime programs don't need CA-dBFast to run the application - just Windows. CA-dBFast is also compatible with CA-CLIPPER, dBASE III Plus, dBASE IV, and FoxBASE.

So whether you want to wake up old applications or build brilliant new ones, there's only one way to marry Windows beauty and Xbase power.

Check out CA-dBFast today.



CA-dBFast's report writer, CA-RET, lets you mix text, graphics and data to produce great-looking reports in minutes.

The Visual Application Designer (VAD) makes creating pull-down menus, push buttons, radio buttons, check boxes, scrolling list boxes and other Windows objects as easy as "point and click" or "drag and drop."

The VAD generates the required source code, saving you hours of complex programming. You also get a

CA-dBFast 2.0 also includes CA-RET - an outstanding Windows-based report writer that lets you mix text, graphics and data on the same report in a full WYSIWYG environment.

Creating great-looking tabular reports, form letters and labels is as easy as using a word processor.

New CA-dBFast Release 2.0.

© Computer Associates International, Inc., One Computer Associates Plaza, Islandia, NY 11788-7000. All product names referenced herein are trademarks of their respective companies.

CIRCLE 400 ON READER SERVICE CARD



COMPUTER ASSOCIATES
Software superior by design.



■ Input Devices

Microsoft Mouse Gets New Look and Feel

BY MARY KATHLEEN FLYNN

Microsoft has revamped the best-selling alternate input device in the world, proving that a product doesn't have to be broken to get fixed. The \$109 Microsoft Mouse 2.0 is larger, longer, and higher than the classic Microsoft Mouse, making it more comfortable for more people to use. And now new Mouse Manager software makes navigating through Windows easier.

To design the new mouse, Microsoft studied the ergonomics of input devices, including extensive usability testing conducted by the Metaphase Design Group and the Uni-

versity of Illinois Department of Kinesiology. This research led to more support for the palm, bigger buttons, a shorter

cable, more accurate cursor placement, and a smoother look and feel.

The new mouse definitely

looks and feels different from the old one. The plastic feels smoother and looks shinier. The shape is different, too; bearing resemblance to an elongated apostrophe or comma. While Microsoft concedes that the new shape is "visually cued for right-handed people," the company insists it is "ergo-



VISUAL CUE: Soap-bar look is gone.

nomically correct for either right- or left-handed use." Only 10 percent of the population is left-handed, and most left-handed PC users hold the mouse in their right hand, but a couple of left-handed *PC Magazine* editors were still put off by the shape.

Most users, however, will agree that the new Mouse Manager software makes it easier to use Windows. The customizable software features include Orientation, which lets you hold the mouse at any angle; Snap To, which jumps the cursor to the default button in a dialog box; Screen Wrap, which, when the cursor reaches the screen's edge, sends it to the other side; Locate, which lets you find the cursor easily by moving it to the screen's center; and Magnify, which lets you zoom in on a screen area.

The most potentially useful feature is Snap To. Unfortunately, it doesn't work very consistently within applications. In Microsoft Excel, for example, if you bring up the File Open dialog box, the cursor will snap to the default button—because the button is an object. But in the Format Numbers dialog box, the cursor won't snap to anything, because the button is just a drawn image. Over time, Microsoft hopes to expand the types of dialog boxes Snap To will support.

For the foreseeable future, Microsoft will sell both the old mouse (also for \$109) and the new one, but expects most customers (including PC manufacturers who bundle the device with systems) to choose the new design.

• List price: *Microsoft Mouse, Version 2.0, serial version*, \$109; *mouse port (PS/2) version*, \$109; *bus version*, \$125; *combination version (Mouse Port and Serial)*, \$125; *combination with Microsoft Windows*, \$225; *five pack*, \$499. Requires: *DOS 2.0 or later. Microsoft Corp. One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080.*

Circle 429 on reader service card

■ Video Boards

SuperMac's Spectrum/24: Snappy 24-bit Color for \$999

BY BEN MYERS

High-resolution, true-color video has never been this cheap. SuperMac Technology's \$999 Spectrum/24 graphics adapter gives digital photography buffs and graphic artists who work with programs like Aldus PhotoStyler, Adobe Photoshop, and CorelDRAW responsive 24-bit video performance at an unprecedented price point.

The Spectrum/24 comes only with 24-bit drivers for the Microsoft Windows environment. The board connects to your current VGA adapter via a short pass-through cable supplied by SuperMac that works with either of the two styles of feature connectors found on VGA cards. There's also an optional \$89.99 snap-on VGA module that lets you use the Spectrum/24 as a single-slot graphics solution. Its installation is simple.

RGB coaxial and 15-pin

monitor cables also come with the board to connect it to the most popular types of monitors on the market today.

The Spectrum/24's Resolution Picker utility allows you to choose from various SuperMac and NEC monitor types, or from custom combinations of various resolutions and refresh rates ranging from 640-by-480 up to 1,152-by-900.

In testing, we found that our Windows screen sometimes came up either off-center or sized incorrectly because monitor timing frequencies are not yet standardized. When this happened, we had to rely on monitor switches or choose another refresh rate for the same resolution to calibrate the size and shape of the on-screen image. SuperMac should add its own Windows utility to handle this adjustment better.

Though the Spectrum/24 runs only in 24-bit mode, it turned in an outstanding Graph-

ics Winmark of 8.4 in PC Labs' benchmark testing. Performance is fine for more mainstream, less color-intensive business applications such as word processing, too.

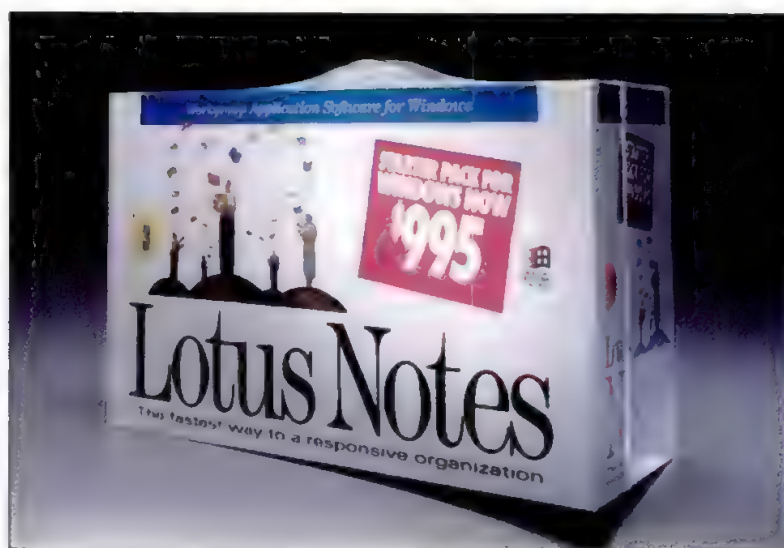
The full-length card is equipped with 3MB of 80-nanosecond VRAM memory, enough to handle high resolutions such as 1,152-by-900 because each pixel of color takes up exactly 24 bits in its memory layout. We tested an EISA version of the board, but SuperMac also has an ISA-bus version and will be shipping a VL-bus version soon.

If the editing and manipulation of 24-bit color images is important in your job, your best bet is to get the model of the Spectrum/24 that matches the fastest PC you use. Then sit back and watch fast 24-bit screen redraws and remind yourself how little you paid to get them.

• List price: *Spectrum/24*, \$999 (*EISA, ISA, or VL-bus models*); *snap-in VGA module*, \$89.99. *SuperMac Technology, 85 Potrero Ave., Sunnyvale, CA 94086; 800-541-7680, 408-773-4498.*

Circle 426 on reader service card

Now there's only one thing standing between you and the power of Lotus Notes. Shrinkwrap.



Introducing the Lotus Notes Release 3 Starter Pack for just \$995.

Lotus Notes is hailed as a dramatic breakthrough in competitiveness. It improves essential business processes by allowing people to access, track, share and organize information in ways never before possible.

And with Release 3, Lotus Notes is available in a Windows® server version. A breakthrough which prompted us to offer our new Starter Pack for Windows® at just \$995. It comes complete with one Lotus Notes Server for Windows® and two Notes clients for Windows®. Plus there are 25 ready-to-go applications such as Account Management, Customer Service and Product Development.

All of which will help you stay competitive.

And all you need to realize the full potential of Notes is Windows®, a LAN, and about \$1000. So stop by your nearest Lotus Authorized Reseller. Or call us at **1-800-828-7086, ext. 8853**, for more information. But do it soon, because this offer is available to everyone. Including your competition.

Lotus Notes

BY EDWARD MENDELSON

DOS 6.0 COMPATIBLE

FACT FILE

The Norton Utilities, Version 7.0

List price: \$179, upgrade \$49

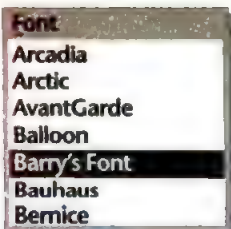
Requires: 640K RAM, 1MB hard disk space, DOS 3.3 or later

In short: Version 7.0 of the classic disk utility collection includes full DOS 6.0 compatibility and new hardware diagnostic tools.

ON READER SERVICE CARD

DISASTER RECOVERY

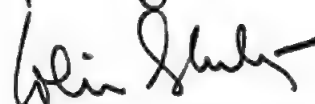
46 PC MAGAZINE JUNE 15, 1993



Name your fonts and select them from any font menu.



A technical document might need a range of fractions or special symbols; create them quickly and easily in a custom font. Time taken to create: 1 minute. Keystrokes required: 6.



Autotrace your signature or any other scanned image—place it in a font and assign it to a keystroke.

Use the calligraphic or pressure-sensitive tool—as well as a full range of drawing tools to design your font from scratch.



Design and create a logo; then assign it to a keystroke.



Blend two fonts to create a third. Time taken to create: 2 minutes. Keystrokes required: 5.

abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
LMNOPQRSTUVWXYZ
Z.1234567890!@#\$%^&
*O+?

This font "TFHabitat" was created in Fontographer by Joe Treacy of Treacyfaces, Inc.



Fontographer always opens a copy of your existing font, keeping your original intact.

Now shipping, with over one billion fonts.

Fonts are like money; the more you have, the more you're able to do. Just think what you could accomplish with an infinite number of fonts.

Fontographer[®] for Windows, the type manipulation and design program from Altsys, gives you that.

And more.

Fontographer actually lets you open copies of your current fonts and—without drawing a thing—automatically modify characters and add new ones, turning your existing typefaces into entirely new personalized PostScript[®] language and TrueType[®] fonts.

Logical one-step commands make font customization quick

and easy. With the Windows version of Fontographer, anyone can blend two fonts to make a brand new one. Vary italic angles. Autotrace scanned images to create new characters. Or instantly increase and decrease type weight.

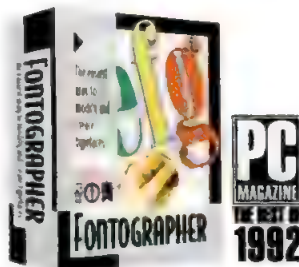
Fontographer also lets you incorporate graphics into your fonts. Imagine a company logo or your signature as a keystroke.

What's more, Fontographer's straightforward interface means you can be creative without being confused. In fact, the hardest part about using Fontographer may be dreaming up names for all your new creations.

But just in case you do need some help, we offer free, unlimited technical support.

According to Ed Mendelson of *PC Magazine*, "PC users... now have the most powerful and well-designed font-editing tool available on a desktop—and probably the easiest font-editing program available anywhere."

To purchase, contact your local dealer or call us at 1-800-477-2131.



Fontographer

The easiest way to modify and create fonts

1-800-477-2131



From Altsys, the people who write Aldus FreeHand[®]

Altsys Corporation • 269 W. Renner Parkway, Richardson, Texas 75080 • (214) 680-2060

All product names are the property of their respective owners.

*How can you get over one billion fonts? It's easy—multiply your current font collection by your imagination.

CIRCLE 192 ON READER SERVICE CARD

■ Palmtop Computers

HP 100LX Adds Remote E-Mail

BY RICK AYRE

With so many rumors circulating about the future of personal digital assistants and handheld computers, it's easy to forget that Hewlett-Packard Co. has already sold thousands of its HP 95LX palmtops. The radically improved \$749 HP 100LX can only strengthen HP's dominance in the field of truly portable computing.

HP calls the 100LX a personal information appliance (PIA) because it enables a powerful kind of mobile computing. The 100LX has cc:Mail Remote electronic mail built in and the potential to be everything from a SkyTel pager to a wireless e-mail gateway.

While its 11-ounce weight and 1- by 6.3- by 3.4-inch (HWD) size makes it small enough for a jacket pocket, the 100LX is a full-screen (80 columns by 25 lines), fully functioning DOS 5-based PC, with 2MB of applications in ROM and 1MB of space to store database files. All this is powered by two AA-size batteries.

No matter what HP calls the 100LX, it's clear that the product goes far beyond the 95LX in features. Hardware improvements begin with the new 80-by-25 screen resolution. The improvements continue with PCMCIA 2.0 support, an improved 9-pin serial port (still nonstandard but more functional), and a better keyboard layout (though the keys are still the same small size).

What's most interesting

about the HP 100LX is all the software stuffed in ROM. The old applications work better, and the new ones add important functionality.

PERSONAL INFO MANAGER

What used to be a very limited address book has turned into a full-featured personal information manager. At its center is an appointment book that's easy to use (all the applications benefit from a new CUA- (common-user access) compliant interface. A simple function-key press switches you from a daily to a weekly to a monthly to a six-month view of your schedule. The address book has an integrated to-do list, space for appointment notes, and a full-text search tool.

Also improved is the Comm Manager, now called the Data-Comm Manager. What was barely functional before is now fully featured. It supports throughput up to 115,200 bits

you set up definition files to save settings for your different communications needs, and the program comes with definition files for popular e-mail services.

CONNECTIVITY PACK OPTION

If you need more connectivity, you'll probably be interested in the optional Connectivity Pack (\$119.95), which provides an easy way to share data between your palmtop and your desktop

FACT FILE

HP 100LX

Hewlett-Packard Co., 1000 NE Circle Blvd., Corvallis, OR 97330; 800-443-1254, 503-757-2004; fax, 503-750-5488

List price: \$749.

In short: The HP 100LX improves on the HP 95LX by adding better screen resolution, a PCMCIA slot, and cc:Mail Remote software.

ON READER SERVICE CARD.

PC. It comes with a serial cable, file transfer software, DOS redirector software, and PC versions of the appointment book, phone book, memo editor, filer, and calculator. Using these tools, you can create or update databases on your desktop PC (with its full-size keyboard) and have up-to-date data in your pocket when you hit the road.

HAND-HELD CC:MAIL

HP and Lotus Development Corp. have a lot to say about the cc:Mail Remote software built into ROM. It's actually better than the cc:Mail Remote you buy for your laptop. Using it, you can compose messages off-line and then call

process, but it lets you download e-mail header files only and mark the messages you want to download. cc:Mail Remote also lets you access your e-mail server interactively, and that means you can access cc:Mail bulletin boards from your 100LX.

Rounding out the software is Lotus 1-2-3, Release 2.4, and the brand new memo editor includes an outliner and text formatting. There is a Rolodex-style phone book and a similarly styled flat-file database. You'll also find an HP financial calculator, a stopwatch, and an application that tells you what time it is anywhere in the world.

All of these applications are one keystroke away. You switch from one to another without shutting down the open application. Using HP's "instant-on" functionality, the 100LX automatically saves your data every time you switch. The keys for the applications are clearly labeled with icons that make sense and are easy to find.

On the down side, the keyboard is still small for real typing; you won't do real word processing on a 100LX. The parentheses keys are now shifted keys located just about where they should be, but important keys, such as the forward slash, are still hard to find.

The LCD screen is clear and crisp, though not bright. The new 80-by-25 resolution results in characters that are small enough to make some users squint. A convenient zoom feature gives you the option of using the old CGA resolution or a new 40-by-16 mode, which results in the largest characters.

The HP 100LX is a compelling way to take just enough computing power on the road, especially if you need to communicate back to a LAN. With options such as modems and hard disk-like flashcards now available on PCMCIA cards, the 100LX is a more scalable solution than the 95LX one, and it can be better customized to your needs. □



SMALL WONDER: The HP 100LX is a great tool for communicating from the road.

per second and file transfer protocols that range from Kermit to X-, Y-, and Zmodem. The Data-Comm Manager lets

and upload them to your networked cc:Mail server. Not only does the software let you send and receive e-mail in a batch

■ Voice Recognition

Listen for Windows Lets Your PC Understand What You Say

BY JOHN R. QUAIN

PCs are better than typewriters, but you still have to face the keyboard. Verbex Voice Systems' Listen for Windows, the latest PC-based voice recognition package, won't remove the QWERTY keyboard from your life, but you may never have to use a mouse again.

Intended for navigation, command, and basic data-entry tasks, Listen for Windows uses a speaker-dependent design rather than a speaker-independent approach. The latter uses general phonetic or linguistic rules for voice recognition. Listen compares spoken sounds to proprietary audio files it has been trained to recognize by the user. Also referred to as language-independent, Listen's approach means that anyone, regardless of diction or accent, can control their PC using spoken commands.

The basic \$695 Listen for Windows Power User's kit includes the Listen software and Speech Commander, an 8-bit ISA sound recognition card, and a headset microphone. On the back of the card there's a VGA-type connector for the microphone, a volume control, and monaural minijacks for audio input and output.

Installing the Speech Commander board is straightforward. It even works with sound cards like Microsoft's Windows Sound System installed. If you do encounter conflicts with other peripherals, jumpers and DIP switches on the card give you enough options to resolve them. On the board, two processors, a Texas Instruments 32-bit TMS320C31 DSP and an 80C188 control processor, manage the calculations for recog-

nizing words and phrases. This alleviates the necessity for a fast PC, allowing Listen for Windows to work equally well on a slow 386SX or a fast 486DX PC.

The software includes voice-command files for the basic Windows desktop, as well as for the Calendar, Calculator, File Manager, Cardfile, and Microsoft Word for Windows. In WinWord, you can edit, indent, change fonts, print, and repaginate without touching the keyboard. Developers can also create context-sensitive speech applications.

Listen for Windows can handle about 300 active words (depending on the length of the words) and 420 word instances (which are similar to word combinations) per application. This is a larger vocabulary than the 42 active words in the Voice Pilot used in the Microsoft Windows Sound System. For more sophis-

BASIC VOICE TRAINING

Unlike discrete speech systems, Verbex's continuous speech recognition lets you speak naturally, even if you slur words together. The disadvantage of Verbex's speaker-dependent continuous speech recognizer is that you need to spend more time training the program. During training, you follow on-screen instructions, repeating words and phrases into the microphone until the program learns to match your instructions with the software commands. Getting a set of application-specific commands running smoothly, such as the 450 words and phrases provided for the basic Windows desktop, takes about an hour.

One of the major benefits of this approach is that, unlike discrete speech designs, you don't need to retrain the system for each separate expression. Listen for Windows' underlying grammar lets you string words together in different combinations, even though Listen was not trained to understand the particular phrase. Once the system has been trained to respond to "move down" and the numbers one through nine, for example, it will also recognize commands such as "move down one," "move down two," and so on. The notational grammar does have limits, however. You're restricted to voice commands of no longer than 24 seconds.

TALKING TO WINDOWS

In testing, the over-the-ear microphone was comfortable. Background noise, whether an FM radio or city traffic, doesn't impede its effectiveness. After a

single training session, most commands work without a hitch. In case you forget a voice command, a Listen window displays the words and phrases available in the active application, while a tiny window displays the last command that was recognized.

New users, however, will discover that controlling Listen takes practice. Because it records your particular speech patterns, it can be fussy. If you speak differently later—for example, faster or more slowly—it occasionally won't respond. If you really run into trouble, you can retrain the program.



SPEAK UP: Listen for Windows includes a headset microphone.

FACT FILE

Listen For Windows, Version 1.0

Verbex Voice Systems Inc.,
1090 King Georges Post Rd.,
Bldg. 107, Edison, NJ 08837;
800-275-8729, 908-225-5225;
fax, 908-225-7764

List price: \$695

Requires: 8-bit ISA slot, 1.5MB hard disk space, Windows 3.1

In short: Listen for Windows is a continuous voice recognition package that is trained to individual voices. Developers can use the included software to create custom voice data input apps



VERBEX VOICE SYSTEMS INC.

ticated applications requiring 1,000 active words and 2,410 word instances, 1MB of fast SRAM is available for \$1,000.

Generally, normal conversation will not trigger unintended commands, although verbal typos can still occur. "15" and "50," can confuse the program, and phrases like "I'll have to look it up," can trigger commands like "edit cut." To reduce miscues, the program's sensitivity can be adjusted using a sliding bar control.

Verbex has been building vertical voice recognition applications for seven years, and the company's experience shows. Listen for Windows is the first practical—and practically priced—voice recognition system for business PC users. But it isn't perfect. So don't expect carpal tunnel syndrome to be supplanted by laryngitis anytime soon. □

■ Multimedia Authoring Software

Create High-End Training Tools with Authorware 2.0

BY ALFRED POOR

When we selected Authorware Professional for Windows, Version 1.0, as the Editors' Choice in our March 31, 1992, evaluation of multimedia authoring software, we pointed out its industrial-strength feature set and said that mastering the program would take a sizable investment of time and effort. Version 2.0 has even more features, but fortunately, the package has become a bit easier to learn and use.

Authorware is a high-end, \$4,995 authoring tool with which you develop learning and training applications using Windows multimedia features (including graphics, animation, and sound). It has been used to create everything from K-12 math and reading programs to training programs for McDonald's employees to training simulations for airline security personnel.

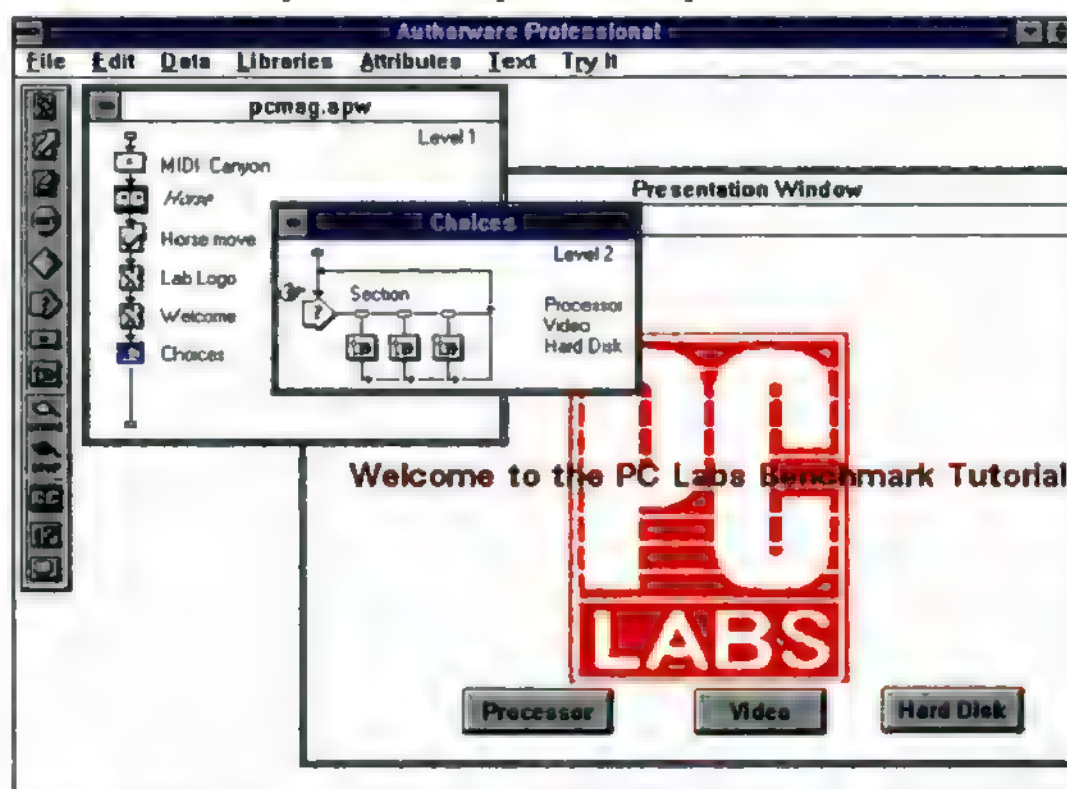
BUILDING ICON FLOWCHARTS

This Windows program relies on a visual flowchart metaphor for creating applications. There are just 12 icons, which you drag into the workspace to construct logic structures.

After inserting an icon into the structural diagram, you can edit its attributes. The program also includes drawing tools so you can create or annotate an image (.BMP, .DIB, EPS, .PCX, PICT, .RLE, and .WMF formats are accepted). You can also define the colors for objects, the special effects used to make them appear (and disappear), and even their display modes, which determine what portion of background will show through.

Icons for branching, either as a result of calculations, user input, or just random selection, are available. A calculation icon can be used to track user scores, trigger events, or use any one of hundreds of defined functions. A "wait" icon can be used to pause the application until the user responds or until a certain amount of time has elapsed.

The workspace has no scroll bars, so if your logic structure gets too big, it won't fit on-screen. This only encourages you to use the Authorware "map" icons, which serve as place holders for a collection of icons. This feature is somewhat analogous to a subroutine in programming. When you double-click on a map icon, it opens another workspace where you can edit its components. Map



APP BUILDER: Authorware uses multiple windows as workspaces.

icons can be nested, so you can keep your application segments small and manageable.

The program also has icons for multimedia functions, including sound, animated movies, and

video. Authorware directly supports both .PCM and .WAV sound-file formats and has custom functions available that support MIDI (Musical Instrument Digital Interface) files and audio CD through the Windows MCI (Media Control Interface).

The program supports a large number of movie file formats, including Autodesk Animator, .FLC, .FLI, and .CEL. Version 2.0 adds support for Macromedia Director files in the .MMM format. It also adds support for Microsoft Video for Windows and QuickTime for Windows (.MOV) files. These last two formats give access to full-motion, digitized video images for your applications. The program supports start-and-stop frames, as well as playback rate. There are also features that support external video playback devices such as laser disks.

Authorware now includes more sophisticated text-handling and interactive-response features. In Version 1.0, you could get user responses through items such as push buttons and free-form text answers. Version 2.0 adds sophisticated options that include irregularly shaped "hot" spots on-screen, as well as

▶ FACT FILE

Authorware Professional for Windows, Version 2.0

Macromedia Inc., 600 Townsend St., San Francisco, CA 94103; 800-288-4797, 415-252-2000; fax 415-626-0554

List price: \$4,995

Requires: 2MB RAM (4MB recommended), 40MB hard disk space, Microsoft Windows 3.0 or later

In short: Expensive but powerful, Authorware Professional for Windows continues to provide the tools that help you put Windows multimedia features in computer-based training applications

401 OWN READER SERVICE CARD

complex projects. For example, you can predefine icon libraries, and that means you can create a collection of often-used items, such as a display icon for your company's logo or a map icon that performs a user log-on subroutine. A single application can call on elements from more than one library, which can reduce development time.

There are even new features that developers can use to maintain applications. A text search-and-replace feature can quickly locate and change occurrences of text on display screens in one step—a big timesaver.

The package includes a runtime version of the program. The standard license permits free distribution of the runtime either within the company that purchases the full package or outside, as long as the application is distributed free.

Though the price of Version 2.0 of Authorware has dropped considerably (to \$4,995 from \$8,000), it's still not cheap. It does indicate, however, that the program isn't called "Professional" for nothing. If you're looking to create high-level, computer-based training materials with multimedia features, Authorware is a serious product that gets the job done. □

Powerful, Colorful, Light & Loaded.

And now the ZEOS® Color Notebook is more affordable than ever: Only \$1995!

Remember what a difference it made when you switched to a color desktop? With the ZEOS Color Notebook, you'll enjoy vivid colors from a palette of 256 on your full-size 9.5" display. And there's more.

✓ Fast drives and loads of storage with hard disk right up to 130MB. ✓ Unbelievable 25MHz SL performance, coupled with our 64K built-in cache. Standard. ✓ Up to 20MB of high-speed RAM for the most demanding applications. ✓ A built-in high density 1.44MB 3.5" floppy drive. ✓ Serial, parallel, external VGA and keyboard ports. Use your system as a desktop PC too! ✓ Send and receive fax/modem available, so you can always stay in touch. And that's not all.

THE INTELLIGENCE OF THE 386SL CHIP.

Intel designed the 386SL processor specifically for notebooks. And they were right on target! You'll find that this sharp processor extends your battery life significantly because it's intelligent enough to power-down the memory, disks, modem, and more when they're not in use. It's perfect for the stop-and-go computing that you're likely to do every day.

MANAGE YOUR POWER.

Or if you're working non-stop, you'll get even more out of the battery by using the program-mable power management features. And here's another really neat benefit we know you'll love. You can change batteries without having to shut off the system! You can even use Suspend/Resume when you're working in Windows. Speaking of Windows...

FREE LOTUS SOFTWARE.

We don't just stop with great hardware. In packages 2 and 3 we're giving you—absolutely free—your choice of either Lotus 1-2-3, Ami Pro or Freelance Graphics. And that's in addition to DOS, Windows, and the new Lotus Organizer—the personal information manager highly recommended by *PC Magazine*. With all the free software you get from ZEOS, you save hundreds of dollars!

WE'RE HERE FOR YOU 24 HOURS A DAY.

Buying from ZEOS means you also receive our award-winning after-the-sale support and service: 24-Hour-a-Day Toll-Free Technical Support, 365 days a year. You also receive our 30-Day Absolute Satisfaction Money-Back Guarantee and One Year Limited Warranty. You're going to be very satisfied. We guarantee it!



BUY WITH CONFIDENCE.

ZEOS is PC Magazine Readers' Choice for Service & Reliability. We're the only PC vendor to earn the "Excellent" rating for both our laptop and desktop systems!

Price
Cut!

Choose your package—or we can custom-build to your specifications!

PACKAGE #1 ONLY \$1995

- 386SL-25 MHz CPU with 64K cache.
- 2MB RAM.
- 80MB high-speed IDE hard drive.
- Built-in high-density (1.44MB) 3.5" floppy drive.
- High-res 640x480 passive matrix color VGA LCD.
- A slim 8 1/2" x 11 1/2"; total system weighs only 6.7 lbs. with battery!
- Light, slip-in, slip-out NiCad battery. A whopping 2.5 hours of battery life typical; more with power management.
- Trickle-charge or one hour quick-charge. Extra battery packs available.
- Suspend/resume—even in Windows.
- When battery runs low you can change batteries without having to shut off the system!
- 85-key keyboard with embedded numeric keypad, 12 dedicated function keys, and true 101-key emulation. Inverted "T" cursor layout.
- Serial, parallel, keyboard and external video ports.
- Math coprocessor support.
- 30-Day Absolute Satisfaction Money-Back Guarantee and complete ZEOS Customer Satisfaction Package.
- One Full Year Limited Warranty.
- 24-Hour-a-Day Toll-Free Technical Support, 365 Days a Year.

PACKAGE #2 ONLY \$2495

Load up your Notebook! We've included free software, internal send/receive fax modem and more...an incredible value!

- 4MB RAM.
- 80MB IDE hard drive.
- Internal send and receive fax modem.
- Custom-fitted carrying case.
- Genuine Microsoft Mouse.
- MS-DOS, Windows 3.1, the new Lotus Organizer, and your choice of either Lotus 1-2-3 for Windows, Ami Pro or Freelance Graphics for Windows.

PACKAGE #3 ONLY \$2995

Go to 8MB of memory, 130MB hard drive, extra battery...this could be the only PC you'll ever need!

- 8MB RAM.
- 130MB IDE hard drive.
- Internal send and receive fax modem.
- Custom-fitted carrying case.
- Additional slip-in, slip-out NiCad battery.
- Genuine Microsoft Mouse.
- MS-DOS, Windows 3.1, the new Lotus Organizer, and your choice of either Lotus 1-2-3 for Windows, Ami Pro or Freelance Graphics for Windows.

ORDER NOW TOLL FREE 800-554-7172

Fax Orders: 612-633-1325
Government: 800-245-2449
Outside U.S. and Canada: 612-633-6131
Hearing Impaired (TDD): 800-228-5389
MasterCard, VISA, Discover, American Express, Z-Card, COD and Leasing Programs.
Open 24 Hours a Day, 365 Days a Year.



Purchase orders from Fortune 1000 companies, governments and institutions subject to approval. Leasing programs are available. All prices and specifications are subject to change without notice. Please call for pricing, specifications and warranty details. All products and company names are trademarks or registered trademarks of their respective holders. © 1993 ZEUS International, Ltd., 1301 Industrial Blvd., Minneapolis, MN 55411-1154. ZEUS is a publicly traded company (NASDAQ symbol ZEOS). CNBR-PCM-8006A

CIRCLE 038 ON READER SERVICE CARD

■ Groupware

Lotus Notes 3.0: Improvements Target Applications Developers

BY DAVID DEJEAN AND
SALLY BLANNING DEJEAN

Users of Lotus Notes may think that the new Release 3.0 isn't much different from earlier releases, and they may not welcome the changes that they do see, like the arbitrary reordering of the command menus. But modifications like these are just on the surface. Deeper down, Lotus Development Corp. has made profound alterations to its client/server workgroup computing environment, changes that are mostly out of sight to end users but mean a great deal to the corporate developers and MIS departments, which comprise Notes' real market.

What these developers are after is Notes' ability to deploy and synchronize company infobases across a wide area network. Everything Notes manages—even electronic mail—is some form of a database, and all that data can be updated ("replicated") every time you log on. At first, Notes was priced to appeal only to large organizations, but with Release 3.0, Lotus is trying to broaden Notes'

acceptance. (For more information on the latest groupware technology, see "Groupware: Are We Ready?" in this issue.)

Release 3.0 of Notes (\$495 per node) delivers many things Notes customers have been asking for. Lotus has put special emphasis on multiplatform support (starting with support for both Macintosh clients and more network operating systems) and much beefier database management and application development.

Smaller organizations will also find that new server software based on Microsoft Windows (rather than OS/2), along with new pricing and distribution policies, will make it much easier to start small with Notes—as small as a server and two clients for \$995.

End users of earlier versions of Notes may find the least to like in Release 3.0. Obvious problems such as weak text formatting haven't been fixed, and new features like full-text searching aren't easy to use. The addition of Lotus's SmartIcons toolbar and changes to the command menu make the program

feel unfamiliar but not particularly improved.

MULTIPLATFORM AT LAST

The arrival of the long-promised Macintosh version (along with soon-to-come versions for several flavors of Unix) makes Notes a multiplatform product at last. While the prereleased Macintosh software we looked at was still unstable, it's clear that Notes for the Mac works just like the Windows and OS/2 versions, and in mixed environments, cross-platform communications and application sharing function well. (Macs aren't full citizens, though; even all-Mac Notes groups require an OS/2-based server.)

The most important changes in Release 3.0 are deep in the program. Macro capabilities, a score of new @ functions, and "Object Activation" (a way of placing a Windows OLE object in a blank form) let developers create much more powerful applications. A pair of @ functions enhances Notes' flat-file database structure by letting it perform table searches. Other @ functions generate dialog boxes, and you can link macros to buttons on forms. All these improvements and many more greatly improve Notes' document-routing and workflow-management capabilities.

New search-and-retrieval software creates full-text indexes and supports Boolean searching that's complex enough to meet the needs of most users (though it may fall short in the eyes of experienced research

librarians). You can save queries, and the software ranks documents for relevance to the search terms. There's also a rough form of query by example that lets you enter search text in the proper fields of an empty form.

The full-text search function brings up its own control panel, which unfortunately isn't very intuitive, especially for unsophisticated users. But this added searching power will be put to good use all the same: The maximum size of a Notes database has been bumped up from 300MB to 1GB.

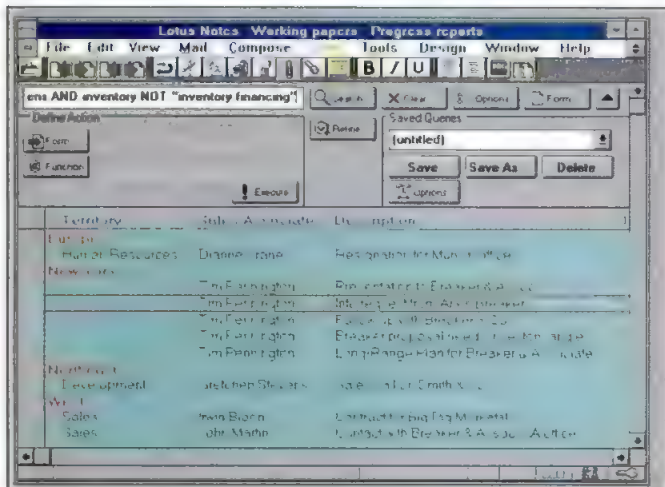
Release 3.0 also provides functions that help Notes administrators set some standards for field names and data formats. Changes made in a template application can be replicated automatically to all the applications based on the template. Fields can be shared among applications, giving administrators some control (however obliquely) over a corporate data dictionary for Notes. The result is that Release 3.0 is a robust development environment that is good for developers comfortable with fourth-generation languages and SQL databases.

WHAT'S IN IT FOR ME?

Release 3.0 offers end users substantially less than it does application developers. Even some of the weakest areas of Notes haven't been improved in the new version. For instance, an egregious bug in earlier versions that prevents you from saving paragraph styles isn't fixed in Release 3.0. Also, Lotus hasn't addressed the need for improvements in import and export for better handling of formatted text and graphics.

Another problem—running Notes remotely via modem—has received only limited attention. Laptop users will find two

FIRST LOOKS PLUS
From June 1 through June 4, you can go on-line on PC MagNet to discuss Lotus Notes with David and Sally Blanning DeJean and Lotus Notes product managers. Type GO ZNT:EXEC from any Compu-Serve prompt.



TEXT SEARCH: You can build and save complex queries.

First Looks

useful features: selective replication, which finally lets you choose to avoid downloading long formatted documents and huge attachments, and replication in the background, which requires many megabytes of memory to work well.

PRICING

The basic price of a Release 3.0 license (either server or client) is \$495. Lotus also sells the \$995 three-license Windows Starter Pack (which contains a Windows server and two clients) and promises to sell an OS/2 starter pack. Notes for ten workstations will cost

less than \$5,000, and it will perform without compromise. The Windows-based server is lim-

works on a larger network.

The paradox is that Notes, once promoted as user-programmable, now looks much more formidable to users who want to develop their own applications—at exactly the same time that Lotus has finally made Notes affordable for very small user-maintained installations.

• List price: Lotus Notes, Release 3.0, \$495 per node; Windows Starter Pack, \$995. Requires: OS/2 server: 12MB RAM, 100MB hard disk space, OS/2 EE or SE 1.2 or later, IBM Extended Services with Database Server for OS/2 1.0, IBM LAN



PUSHY: You can attach entire applications to buttons embedded in Notes forms.

ited to ten concurrent users, but it works for them just as well as its big brother OS/2 server

Remote-Control Software

pcAnywhere: Look Through Windows to a Remote PC

BY CAROL ELLISON

Symantec Corp.'s Norton pcAnywhere, Version 1.0 for Windows, is the best communications news telecommuters and other remote PC users have had in years. It's not the first remote-control package to run Microsoft Windows apps across phone and cable connections, but it's the fastest and easiest to use.

Not only can this Windows application remotely run both Windows and windowed or full-screen DOS applications, it supports more than 90 types of modems that can handle up to 115,200 bps, across-the-LAN connections and modem sharing for both NetBIOS and IPX networks, a scripting language with more than 140 commands and a healthy array of terminal emulations for connections to mainframes and on-line services.

Gone is the tedious wait for the remote screen to refresh when you're working remotely with Windows applications. pcAnywhere's Windows drivers intercept and compress Windows' own video calls and speed

them along the connection in a fraction of the time it takes to send a bitmap. At 9,600 bps, a remote session between two 386-based PCs showed hardly any time lag at all.

What's most impressive is

on the host and remote screens. File transfers are as easy as dragging and dropping a file or directory across a file-transfer screen that displays host and remote files and directories in split-screen File Manager style.

The software is a snap to install and configure for individual use. Network installation requires an understanding of rights, shared directories, file paths, and environment vari-

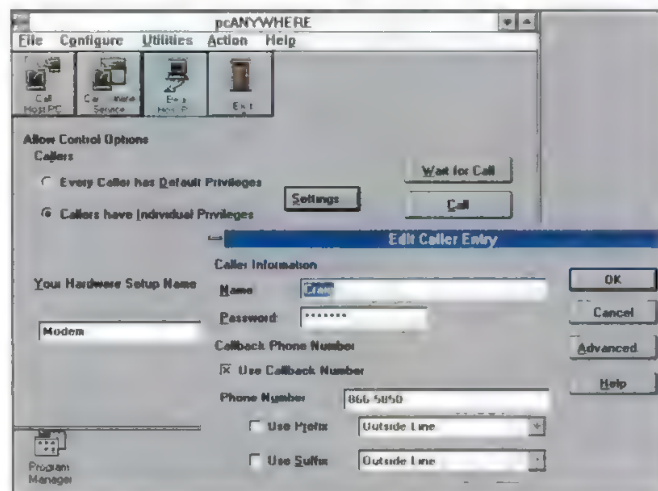
ables. But you're prompted through it with easy-to-understand menus.

users will want to take advantage of the many individual security features and customization options. pcAnywhere offers the standard suite, which includes multilayer password protection as well as dial-back, screen-blanking, and keyboard-locking to keep intruders away.

The network capabilities in the basic \$199 package are limited to individual node-to-node connections, making pcAnywhere useful for delivering support to single users but not for group training. The \$599 LAN Complete Pak can handle five additional simultaneous users.

If you've avoided remote computing because the software seemed too mysterious, too slow, or too limited for your needs, the Windows version of pcAnywhere should change your mind. And if you're already working remotely, it's a great upgrade.

• List price: Norton pcAnywhere, Version 1.0 for Windows, \$199; five-user LAN Complete Pak, \$599; upgrade from Version 4.5 for DOS, \$69. Requires: 2MB RAM, 5MB hard disk space, Microsoft Windows 3.x. Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 800-453-1054, 408-253-9600; fax, 408-253-4092.



PRESS AND PLAY: You control pcAnywhere via four buttons.

Symantec's excellent use of Windows. You control program operations from four simple buttons on a master program screen and (during remote sessions) from activity menus that pop up

ables. But you're prompted through it with easy-to-understand menus.

The program has a "quick connect" feature to get you started immediately, but frequent

New dBASE IV v2.0 gets you home for dinner



BEST NEW
DATABASE MANAGER
MOST IMPROVED
DATABASE PRODUCT



PREFER TO DO
BUSINESS WITH
PLAN TO BUY
INSTALLED IN
COMPANY

Speed where it counts

dBASE® gets your work done faster because it's more usable. A recent study by Usability Sciences Corporation proves it! For everyday tasks, dBASE users get their work done 25% faster than people who use FoxPro.* It's like getting an extra two hours out of every business day!

dBASE IV outfoxes the competition

	dBASE IV	FoxPro
Industry standard	Yes	No
Designed for users	Yes	No
Designed for programmers	Yes	Yes
Queries optimized for stand-alone & networked computers	Yes	No
Instantly accessible visual design tools	Yes	No
Full cross-platform compatibility	Yes	No
Transaction processing	Yes	No
Multi-level password protection & data encryption	Yes	No

▲ dBASE meets a much wider range of needs than FoxPro.

*The results of the Product Comparative Usability Testing—DOS Database Software, dated September 1992. †Software Digest Rating Report, multiuser database programs, May 1992. ‡dBASE IV v2.0 and dBASE Compiler sold separately. Copyright © 1993 Borland International, Inc. All rights reserved. All Borland product names are trademarks of Borland International, Inc. Prices good in the United States and Canada only. All prices are in U.S. dollars. Dealer prices may vary. B1 4384.1

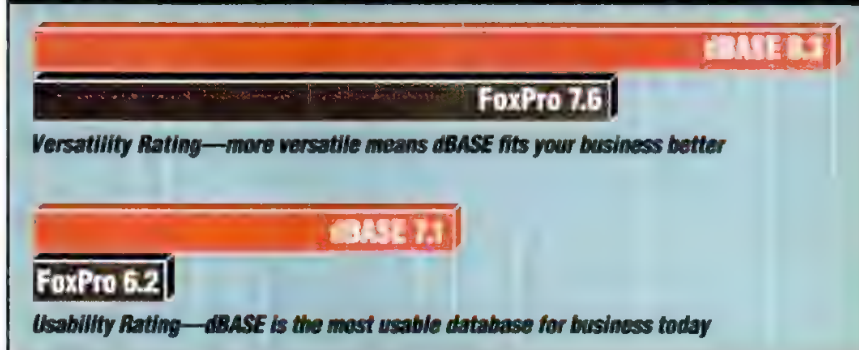
The fastest dBASE ever

New version 2.0 is up to ten times faster than dBASE IV® v1.5 and dBASE III PLUS®! Whether you are browsing data, executing queries, or generating reports, dBASE gets your job done faster—even on networks.

dBASE makes it easy to do more

Powerful visual design tools give you the power to create database tables, queries, forms, and reports on the screen. You see what you are doing every step of the way. Query By Example gives you fast answers to your questions. A versatile Report Writer gives you the

More versatile . . . more usable



▲ NSTL found dBASE to be the favorite of both novice and experienced users alike in Overall Usability and Versatility.

widest choice of report styles available. And with the dBASE Control Center, it's easy to create or enhance your database application without programming. No wonder NSTL rated dBASE tops in versatility and usability.*

The #1 choice for application developers

The industry-standard dBASE language, along with visual design tools, integrated editor, and multi-window debugger, helps you create powerful applications in record time. And now it's easier than ever to distribute your applications using the new, 100% language-compatible dBASE Compiler† that generates royalty-free .EXEs!

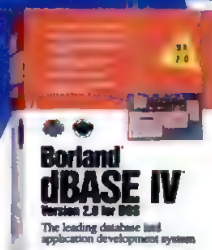
Today, more than four million people use dBASE to help them run their businesses and maintain a competitive edge. Get dBASE today and get home for dinner tonight.

SPECIAL UPGRADE PRICE

\$99⁹⁵

(Suggested list price \$794)

Offer good for standalone or LAN upgrades.



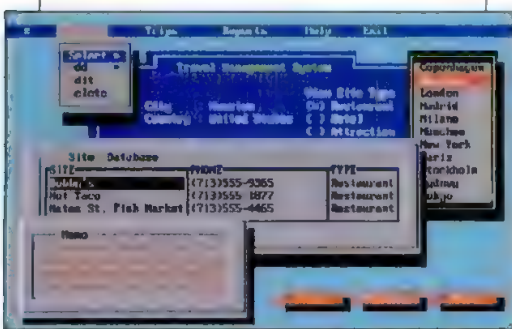
90-day, money-back guarantee!
See your dealer or call now,
1-800-336-6464, ext. 5095
 In Canada, call 1-800-461-3327.

Borland
 Power made easy

CIRCLE 220 ON READER SERVICE CARD



▲ From the dBASE Control Center, your data is only a mouse click or a keystroke away.



▲ Build sophisticated applications in record time.

■ Animation Software

\$995 StrataVision 3d PC: Move Over, Steven Spielberg

BY JEFF MACE

If you admire high-end broadcast-quality special effects, animation, and morphing sequences, Strata's StrataVision 3d PC may be your ticket into that world. At \$995, StrataVision can produce the same stunning results as its pricier competition, Autodesk's 3D Studio (\$2,995) and Crystal Graphics' Topaz (\$4,995). But unlike the others, StrataVision can output directly to a videotape deck capable of single-frame insert edits from a Super VGA, VGA, or Targa+32 card.

But don't expect to create a new animated logo for CBS on your first day. StrataVision's world is a complex one, where animations contain three-dimensional text that flies in from off-screen, tumbles around under changing light sources, and flashes with special effects. Pulling the pieces together is a challenge. Multimedia users will be happy to know that StrataVision animations can be saved as .FLC, .FLI, and .TGA files.

DOS-BASED

With a somewhat klunky DOS interface that's not totally mouse-friendly, the program might make you feel a little intimidated when you're first learning it. But a comprehensive tutorial and a "Getting Started" videotape will help get you up to speed. StrataVision 3d PC is not simply ported over from StrataVision 3d PC for the Mac. It started out as AIM-3D, which Strata acquired from AIM Graphics, so users familiar with the Mac version will face the same learning curve.

StrataVision is organized into three sections, all accessible from the main menu. The Object

Creation, Sequence Creation, and Utilities sections each contain a number of modules, many of which let you move from one to another.



PHOTOREALISM: Infinite light and camera angles.

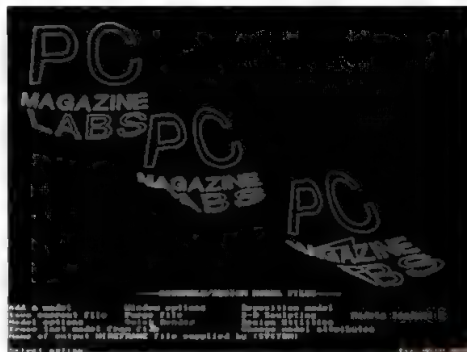
You start by creating two-dimensional objects with drawing tools. Here you create and set attributes for 2-D objects that will later be assembled into 3-D models in the Assemble/Design module. There are four different modeler types: Flat, Revolve, Sweep/Outliner, and Sweep/Sweeper. We used the Revolve modeler to create a lamp simply by drawing the outline of one side and setting different line colors and texture maps for each section.

The Sweep modelers are used to create an extrusion treatment that can be applied to any 2-D object while it's being assembled into a wireframe. Both the 2-D object and the wireframe are saved as .KEY files, which the system recognizes when you bring them into the Assemble/Design module, where a wireframe model is created.

You can do a Quick Render to make sure that your texture maps and other treatments (such as transparency level, color, and shading) have been applied

correctly (50 texture maps are supplied, and you can also create your own from any bitmapped file). Then you use the 3-D modeling tools to fine-tune your model.

Perhaps the most powerful 3-D modeling feature in the program, and a feature unique to StrataVision, is SuperSculpting, which uses the Coons Patch mathematical formula to create a new contour for the sculpted model. By selecting



MORPHING: Transform any wireframe.

1 of the 12 edges of the cube that the program uses as a template, you can augment parts of the model's shape by moving vertices or tumbling and rotating selected edges in any number of ways. Much experimentation is necessary in the beginning to achieve the desired result, but the time spent can lead to amazing results.

Models created with SuperSculpting are great to use in wild

metamorphosis sequences; that is, series of transformations from one wireframe to another. StrataVision creates "in betweens" from one model to the other. You can even generate this type of sequence between .KEY files with different numbers of points. This is a well-engineered and easy-to-use part of the program. We used morphing to transmogrify a sphere into a lamp, and it was surprisingly easy to do.

Laying out a motion path is necessary when animating several different objects together, and StrataVision handles this well. You lay out your motion path by clicking the mouse to set the points along which the animation will move. Then you're ready to create a run sheet. Set up like a spreadsheet, the run sheet integrates all your sequences and special effects along with your models and motion paths and then generates your animated sequences.

Rendering is always a time-consuming process, especially when you have several light sources and shadows. StrataVision includes Numerical Design's rendering engine, which during testing (on a 50-MHz 486 system with 16MB of RAM, a 7MB RAM drive, and a 32MB virtual swapfile) proved to be fast, rendering 60 frames in 73 minutes.

Despite the steep learning curve and an interface that's in need of context-sensitive help, it's hard to beat StrataVision's versatility. The program is for anyone who needs to do complex 3-D modeling, photo-realistic rendering, and animation with broadcast-quality special effects. StrataVision may be the way you finally get into show business.

• List price: *StrataVision 3d PC*, \$995. Requires: 4MB RAM, 10MB hard disk space, DOS 5.0 or later, math coprocessor. Strata Inc., 2 W. St. George Blvd., Ancestor Square, St. George, UT 84770; 800-678-7282, 801-628-5218; fax, 801-628-9756.

Circle 417 on reader service card



When you already have a

best seller like the KX-P1123 Dot Matrix

Printer that delivers outstanding print quality, speed and

reliability for the money, what do you do for an encore? We asked people just like you and they told us to make it quieter.



WE ASKED PEOPLE HOW TO IMPROVE OUR BEST SELLING PRINTER. THEY TOLD US TO BE QUIET.

So, we added Panasonic's Quiet Technology and created the new KX-P2023 24-pin Dot Matrix printer. But, we didn't stop there. At the same time we made it easier on your ears, we made the KX-P2023 much easier to use with an all-new, user-friendlier control



Simplified Control Panel

panel. We also made it easier to load and even more reliable with a belt-drive tractor feed and a



Belt-Drive Tractor Feed

simplified paper path. Plus, like all Panasonic Dot Matrix Printers, the KX-P2023 is backed by a two-year limited warranty.* No wonder the 1992 PC Magazine Service and Reliability Survey rated Panasonic "Excellent" on reliability, service and support.

Why would Panasonic take a proven winner and improve it? Because the surest way to create another best seller is by making things better.

*See your dealer for warranty details.

For more information visit your Panasonic dealer or call 1-800-742-8086.





The best reasons in the world to choose Primavera software.

Melbourne Cricket Ground, Australia

The new 47,000 seat Great Southern Stand replaces the smaller original built in 1937. *Finest Hour*® helped schedule and coordinate the project's extensive concrete work.

U.S. Embassy, Bolivia

Primavera software is being used to control the construction of the new \$30 million U.S. Embassy in La Paz.

Remote Sensing Satellite, Canada

RADARSAT is a low orbit satellite that will take radar images of the earth. The engineering, design and manufacturing stages for this \$300 million project are being scheduled using Primavera Project Planner® (P3®).

The Autobahn, Germany

P3 will be used to rebuild the Autobahn in what was formerly

East Germany. Both contractors and subcontractors are standardizing on Primavera for this project.

New Hong Kong Airport, Hong Kong

This \$20 billion airport construction project also includes the construction of highways, an airport rail system, a suspension bridge and a cable stay bridge. Projected completion date is June 1997.

Kuala Lumpur Tower, Malaysia

This \$100 million, 420-meter tower will be the third tallest communication tower in the world. Estimated completion date is 1996.

The Georgia Dome, USA

The new \$210 million structure features the world's largest cable-supported dome. P3 and Expedition® were used for scheduling and control.

Think about project management, and one name comes to mind. Primavera.

It's the software that people who run projects have come to rely on.

Call 1-800-423-0245 for a Free Preview Disk that shows what Primavera Project Planner can do for your projects. Or ask for a personal demonstration of Primavera capabilities in scheduling, resource management, cost control, performance measurement, contract control, communication and risk analysis.

We've got all the software you need to put your project on the map.



PRIMAVERA

How the world says project management

Two Bala Plaza • Bala Cynwyd, PA 19004 • USA
(215) 667-8600 • FAX: (215) 667-7894

International Business Park • Europe Building
F-74166 Archamps • France • 33-50.31.57.80
FAX: 33-50.31.57.85

CIRCLE 148 ON READER SERVICE CARD

See us at *Condex/Windows World* Booth #W7476

New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Brad Grimes

NEW

Platinum Overhauls Flagship Program, Releases New Module

Platinum Software Corp. has announced Platinum, Version 4.0, a major upgrade to its LAN-based integrated financial and accounting program; and Platinum Publisher, a visual report generator and the company's first Windows module. Platinum 4.0, a suite of accounting applications ranging from a Foreign Currency Manager to a General Ledger, now supports Windows so you can run multiple Platinum sessions. Specific modules that have received enhancements include the Inventory, Purchase Order, and Order Entry modules. In the PO module you can process orders across multiple locations; in the Order Entry module, improvements include indirect invoicing, enhanced reporting, and shipping and order profiles.

Platinum Publisher works with the Platinum accounting program to process queries across several databases and generate quality reports. It includes object-oriented design tools and supports OLE (Object Linking and Embedding), DDE (Dynamic Data Exchange), and the MDI (Multiple Document Interface). You can link reports in Platinum Publisher to data from a variety of Windows applications, and the report generator comes with a syntax-compatible macro language that resembles Visual Basic.

- List price: *Platinum, Version 4.0*, \$1,295 to \$1,995 per module; *Platinum Publisher*, \$1,995 for entry level LAN module. **Platinum Software Corp.**, 15615 Alton Pkwy., #300, Irvine, CA 92718; 800-426-0469, 714-727-1250; fax, 714-727-3514.

Circle 403 on reader service card



Platinum Publisher creates accounting reports.

Photography by Thom O'Connor

HOT
PROSPECT



Canon's New Notebook Has a Built-in Bubble Jet Printer

It's a notebook! It's a printer! Stop, you're both right! **Canon Computer Systems'** innovative design, produced jointly with IBM Japan, is landing on U.S. shores. The Canon NoteJet 486 is based on Texas Instruments' 25-MHz 486SLC processor and has a built-in, 360-dpi Bubble Jet printer under the keyboard and two PCMCIA Type 2 slots. Now when you're away from the office you can print your files or even receive faxes on paper using a PCMCIA-compatible fax modem.

The 7.7-pound NoteJet 486 isn't much larger than a normal notebook (2.2 by 12.2 by 10 inches HWD), and its nickel cadmium battery is rated at a respectable 4 hours when printing just 8 pages. It has 4MB of RAM, an 85MB hard disk, a 9.5-inch Sharp LCD screen capable of 640-by-480 resolution (it doesn't support simultaneous external display), and a clever hand-held printing device. The printer operates at 116 characters per second, with a 10-sheet feeder and a user-replaceable ink cartridge and printhead. The ink cartridge prints approximately 65 pages and costs \$8, and the print head lasts about 3,000 pages and costs \$43.

- **Canon NoteJet 486**, \$2,499. **Canon Computer Systems Inc.**, P.O. Box 5048, 123 E. Paularino Ave., Costa Mesa, CA 92628; 800-848-4123, 714-438-3000; fax, 714-438-3099.

Circle 402 on reader service card

NEW

Dell Subnotebook Has a Sibling

It took a while to get the Dell 320SLi subnotebook PC out the door, but now that it's been done, **Dell Computer Corp.** will try to improve on its marketing effort with the new 325SLi. It too weighs less than 4 pounds, is a mere 1.25 inches high, and comes standard with 2MB of RAM, a 60MB hard disk, and a PCMCIA Type 2 expansion slot. But the 325SLi, as the name implies, is driven by an Intel 25-MHz 486SL processor for enhanced performance over the system's 4-hour battery life. Models are also available with 4MB of RAM and 80MB, 120MB, or 200MB hard disks, and Dell offers several PCMCIA-standard data/fax modems that support transfer speeds of up to 14,400 bps.

- List price: *Dell 325SLi*, \$1,499. **Dell Computer Corp.**, 9505 Arboretum Blvd., Austin, TX 78759-7299; 800-289-3355, 512-338-4400; fax, 512-794-4238.

Circle 414 on reader service card

NEW

New AST Notebook Is Pen Ready

First came GRiD Systems Corp.'s Convertible notebook PC, and now **AST Research** has its own version of the same pen/notebook computer. The 5.5-pound, 25-MHz 368SL-based PenExec is a notebook PC until you flip over the hinged display and put the wireless stylus to the screen's surface. It comes with 2MB or 4MB of RAM, a 120MB or 200MB hard disk, one PCMCIA Type 2 slot, and an external floppy disk drive. Preinstalled software includes MS-DOS 6.0, Windows 3.1, Windows for Pen Computing, and a demo version of PenWare's PenCell spreadsheet program, which is Excel- and Lotus-compatible. A suite of pen applications known as the AST Pen Essentials is available from Slate Corp. and is marketed through resellers. It includes LooseLeaf Notetaker, Delrina's WinFax Pen, Day-Timer Pen Scheduler, and PenBook Business Reference Pages.

- List price: *AST PenExec*, \$2,895; *AST Pen Essentials*, \$495. **AST Research Inc.**, 16215 Alton Pkwy., P.O. Box 57005, Irvine, CA 92619-7005; 800-876-4278, 714-7274141; fax, 714-727-9355.

Circle 404 on reader service card

New & Improved

NEW

FolderBolt Your Directories For Maximum Security

Applications of all types are finding their way from the Mac to the PC, including **Kent Marsh Ltd.**'s FolderBolt security software, which now provides simple directory protection under Microsoft Windows. It's not memory-resident, so your files are protected even when Windows isn't running. With FolderBolt for Windows, there are three types of protected folders (or directories): completely secure, so you can't access any files without a password; read-only, so you can use applications or view files but can't make changes; and password-protected "drop" folders where you or other users on a LAN can place files that are only accessible by authorized users. If you forget any passwords, there is an Administrator program that, once accessed, acts as a master key for overriding directory security.

FolderBolt for Windows also maintains an activity log so you can see who accessed what folders and when, from the time they started to the time they stopped. The program also performs an automatic internal virus check for added security and lets you automatically relock all the folders that were unlocked since booting up your PC when you exit Windows.

• List price: *FolderBolt for Windows*, \$99. **Kent Marsh Ltd.**, Kent Marsh Building, 3260 Sul-Ross, Houston, TX 77098; 800-325-3587, 713-522-5625; fax, 713-522-8965.

Circle 405 on reader service card

IMPROVED

FotoMan Plus: Point and Click, but Smile First

It may not seem obvious what **Logitech** has done to make its FotoMan Plus Digital Camera better. But when you try it you'll soon discover that its resolution has been increased 67 percent, battery life is up from 36 to 100 hours, and the speed and accuracy with which the camera communicates with a serial port during data transfer has been enhanced.

The main lens of the FotoMan Plus is now 65 mm rather than 55 mm (making it better for portraits), and a self-regulating flash ensures proper exposure from 16 inches to 6 feet. The camera's on-board software has been improved, and it now supports JPEG compressed files.

Also new: the tactile feedback trigger that immediately confirms you've taken a picture. For die-hard photographers, a variety of lenses, including wide-angle, telephoto, and close-up,

BRIEFS

CD-ROMs

IBM's educational systems company, **EduQuest**, has unveiled *Picture Atlas of the World* (\$143), a world atlas on CD-ROM, codeveloped with the National Geographic Society and featuring recent world changes, maps, captioned photos, essays, computer animation, and music, video, and audio clips. Each country has a menu that lets you see more maps showing cities, transportation networks, and places of interest. The product is available at a national education discount price of \$100. 800-426-3327.

World Library has announced *Murder, Mystery, Magic, Terror & More* (\$49.95), a CD-ROM containing 171 classic murder and mystery stories in Windows/MPC-compatible format, with search and cut-and-paste capabilities, and both DOS and Windows versions on the same disk. The vendor has also announced joint Windows/DOS versions of the *Greatest Books Collection* (\$49.95) and the *Electronic Home Library* (\$79.95). 714-748-7197; fax, 714-748-7198.

Softbit is shipping *Power Tools for DOS* and *Power Tools for Windows* (\$99.95 each), two CD-ROM products with a wealth of productivity tools. The DOS disk contains over 3,000 applications and utilities ranging from accounting to word processing; the Windows disk has over 600 tools including drivers, fonts, and entertainment programs. 714-251-8600; fax, 714-261-7336

Bureau Development, the company that put *Monarch Notes* as well as great works of literature on CD-ROM, has announced *The Complete Twain* (\$39.95), over 300 works of Mark Twain, including essays and letters; and *Multimedia World History* (\$79.95), over 75,000 pages of text, 600 photos, illustrations, and maps, and 70 video segments covering the history of the world. 201-808-2700; fax 201-808-2676

SOFTWARE UPGRADES

Symantec Corp. is shipping *The Norton Desktop for Windows*, Version 2.2 (\$179), which is MS-DOS 6.0-com-

are available from third-party suppliers. Current FotoMan users can buy software-only or complete hardware/software upgrades directly from Logitech, and Unix versions are also available.

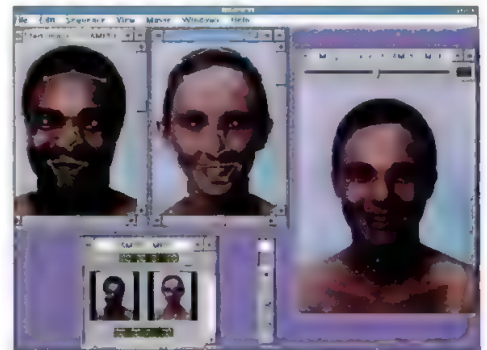
• List price: *FotoMan Plus Digital Camera*, \$799. **Logitech Inc.**, 6505 Kaiser Dr., Fremont, CA 94555; 800-231-7717, 510-795-8500; fax, 510-792-8901.

Circle 406 on reader service card

NEW

Terminator 2 Meets the PC: Vendors Ship Morphing Software

Two software vendors are bringing morphing, the technology that turned the villain in *Terminator 2* into a Swiss Army knife, to Windows-based PCs. **Gryphon Software Corp.** is porting its Mac product, *Morph*, while **Black Belt Systems** is bringing over its Amiga product, *WinImages: morph*. In both products, you specify a starting image and an ending image that appear side by side on your screen. Then you click on a number of points in an image, and the software makes the changes over a certain number of frames.



In *Morph for Windows*, you pick points on two images and let the software perform the changes.

Images can be saved in a variety of animation formats for exporting to videotape or film, as well as in single-frame image formats such as .GIF, TIFF, and Targa. Both vendors recommend that you run the programs with more than 4MB of RAM and at least 1MB of video RAM to support 256 colors, plus any number of other performance enhancers from an accelerated video card to a math coprocessor. Look for Windows NT versions to further accelerate morphing performance.

• List price: *Morph for Windows*, \$149. **Gryphon Software Corp.**, 7220 Trade St., #120, San Diego, CA 92121; 619-536-8815; fax, 619-536-8932. *WinImages: morph*, \$199.95. **Black Belt Systems**, 398 Johnson Rd., Glasgow, MT 59230; 800-852-6442, 406-367-5513; fax, 406-367-2329.

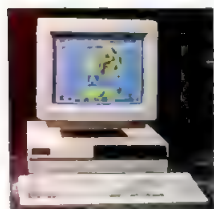
Circle 407 on reader service card

FLYER SC 3/33

- Intel 33-MHz 386SX™ CPU
- Upgradeable to i486SXD
- 2-MB RAM (expandable to 16-MB)
- 60-MB Hard Drive (other drives available)
- Integrated SVGA
- MS-DOS 6.0



\$699



FLYER SD 4/25s

- Intel 25-MHz i486SX CPU
- Upgradeable to i486DX2
- 2-MB RAM (expandable to 16-MB)
- 80-MB Hard Drive (other drives available)
- Integrated SVGA
- MS-DOS 6.0
- Windows 3.1 • ALR Mouse

\$899

FLYER SD 3 4/33

- Intel 33-MHz i486DX CPU
- Upgradeable to i486DX2
- 4-MB RAM (expandable to 36-MB)
- 32-Bit Memory Data Path
- 170-MB Hard Drive (other drives available)
- Integrated SVGA
- Super VGA Monitor



INCLUDES SVGA MONITOR

\$1699



FLYER SD 4/33

- Intel 33-MHz i486DX CPU
- Upgradeable to i486DX2
- 8-MB RAM (exp. to 32-MB)
- 256-KB Cache
- 240-MB HD
- Integrated SVGA
- Super VGA Monitor
- 12 Drive Bays
- 10 ISA Expansion Slots

INCLUDES SVGA MONITOR

\$2495

Fastest... Most Powerful... Best Value... Winner... it seems like editors are always saying the same things about our PCs. But who can blame them for being repetitive, especially when you look at the new generation of ALR systems.

And it's not just our systems that have won industry praise. We've created a service and support program that PC World described as being "among the best." Our unique five year/fifteen month limited factory warranty delivers an unheard of five years of security. We even cover systems purchased through ALR's PrimeLine Direct with a 30-day money back guarantee, so you know you can buy with complete confidence!

30 DAY MONEY BACK GUARANTEE



"It's really fast and the service is impeccable..."

PC WORLD May 1993

EVOLUTION IV

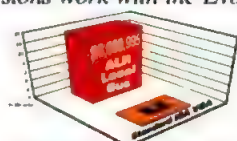
Introducing the ALR



VESA VL LOCAL BUS SYSTEM

4/33s

With its VESA VL local bus, powerful i486 processing, and finely tuned 32-bit architecture, this remarkable system sets a new standard for desktop performance and compatibility. Two VESA VL extensions work with the Evolution IV's six ISA (or available



Video Performance Under Windows i486DX2/66 CPU, Winmarks V.2.5, High Score Wins

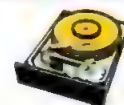
EISA) slots to provide twice the data path and three to four times the speed of the ISA bus alone. VESA compliance guarantees compatibility with a variety of third party local bus enhancements (video adapters, disk controllers, etc.), while adaptability to future applications is enhanced by a single chip upgrade path to Pentium processing. A third local bus slot, ALR's CL extension, accommodates the innovative ALR TriCombo™ board. This unique option combines local bus cache and video with high performance Ethernet networking capabilities.



33-MHz i486SX™ CPU
i486DX™ UPGRADEABLE
Plus 66-MHz i486DX2™ &
PENTIUM™ Technology

4-MB RAM
(Upgradeable to 52-MB)

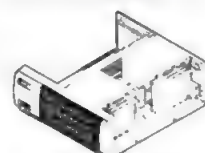
170-MB IDE Hard Drive



SVGA Monitor



2 VESA VL & 1 CL LOCAL BUS SLOTS,



6 ISA SLOTS
6 DRIVE BAYS

MS-DOS® 6.0,
MS-Windows™ 3.1
ALR Two-button
Mouse

\$1545

CIRCLE 130 ON READER SERVICE CARD

ALR

Advanced Logic Research, Inc.

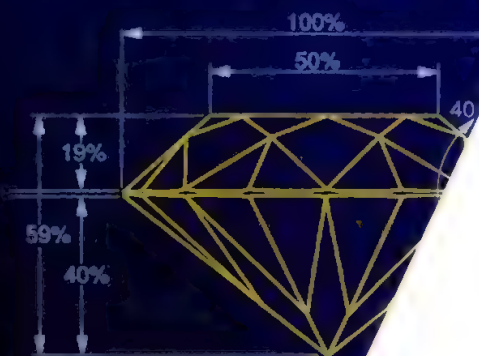
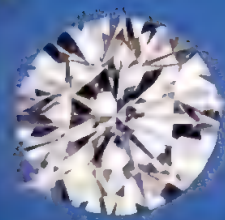
9401 Jeronimo Irvine, CA 92718
(714) 581-6770 FAX: (714) 581-9240

800-444-4ALR

M-F 7AM-5PM SAT. 7AM-1PM PST



* Optional One Year On-Site Service for as little as \$9.95 applies to selected models only. Verify exact options with ALR. Prices and configurations are subject to change without notice. Verify competitive pricing with manufacturer. Prices based on U.S. dollars. ALR is a registered trademark of Advanced Logic Research, Inc. Intel Inside logo is a trademark of Intel Corp. All other brand and product names are trademarks or registered trademarks of their respective owners. ©1993 by Advanced Logic Research, Inc.



Nothing Endures Like A Diamond.

The diamond. A product of the millennia that is everlasting. Clear, brilliant and dazzling – an appropriate reflection of the literal translation of the Mitsubishi name, which means *Three Diamonds*. Like the diamond, Mitsubishi's family of 14"/16" value priced Diamond Scan and 14"/17" high performance Diamond Pro®

color monitors are the industry benchmark for quality and longevity, as

well as application versatility. ♦ All Mitsubishi monitors feature high-resolution and low

emission designs – at an affordable price. And unlike other monitors that

often fail after just one year, Mitsubishi monitors are engineered to last

and are backed by a two-year warranty on parts and labor. ♦ The

Diamond Scan 14 has SVGA performance up to 1024 x 768 interlaced, while the Diamond Pro 14 offers flicker-free 1024 x 768 non-interlaced resolutions (up to

72 Hz) for full Windows™ compatibility. ♦ For advanced Windows or Macintosh® based

high-resolution applications requiring a larger display, the Diamond Scan 16 provides 39%

more display area than 14" models and 19% more than 15" FS designs, without crowding your

desktop. The Diamond Pro 17 offers an even larger

Trinitron® CRT, yet has the most compact enclosure

of any 17" display. Both models feature the Diamond

Match Color Calibration System for precise on-

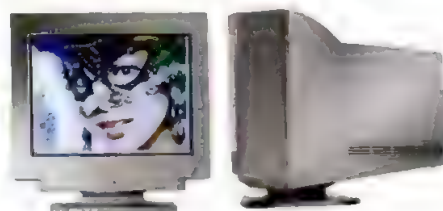
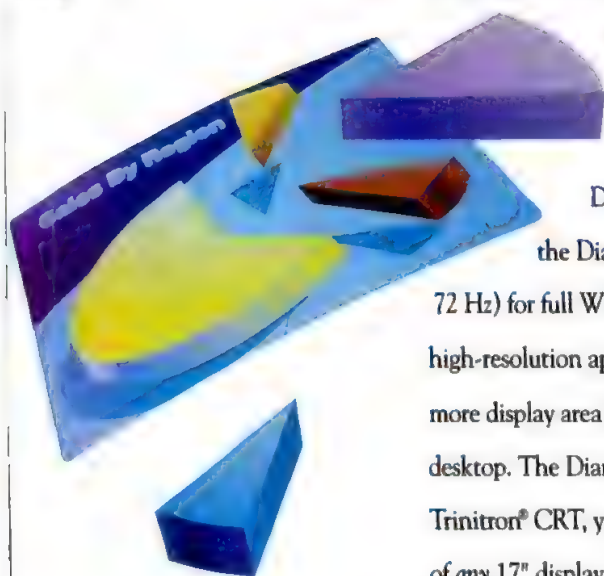
MSRP: DS14 \$499; DS16 \$1169

screen color matching. ♦ The Diamond Scan and Diamond Pro color monitors. Because

MSRP: DP14 \$599; DP17 \$1499

nothing endures like a diamond. ♦ For more information about our full line of color monitors

call us at 1-800-843-2515. In Canada, call 1-800-387-9630 or in Mexico 91-800-83456.



 **MITSUBISHI**
DISPLAY PRODUCTS

Mitsubishi Electronics America, Inc., Display Products, 5665 Plaza Drive, Cypress, CA 90630
Mitsubishi Electric Sales Canada, Inc., 4299 14th Avenue, Markham, Ontario L3R 0J2

CIRCLE 280 ON READER SERVICE CARD

© 1993 Mitsubishi Electronics America, Inc. Diamond Pro is a registered trademark of Mitsubishi Electronics America, Inc. Trinitron is a registered trademark of Sony Corp. Windows is a trademark of Microsoft Corp. All other trademarks or registered trademarks are the property of their respective holders. Screen images produced from the following companies: Eastman Kodak Company (Kodak Photo CD); PCA, Inc.

New & Improved

NEW

New Server from Ariel Design Satisfies the Power Hungry

Ariel Design, known for sparing no expense when it puts together a high-performance system, is offering a new file server to make the power user drool. The Ariel 486DX2-66EVS is an EISA-based tower PC with two VESA local-bus slots and an AMI EISA/SCSI Host Adapter. The AMI Enterprise III motherboard holds up to 256MB of RAM (8MB come standard), has 256K of external cache, and has a P24T ZIF socket for future Pentium technology upgrades. The video subsystem is based on the new SixGraph Wizard 9000VL, which uses Weitek's sizzling P9000 coprocessor with 2MB of VRAM, and supports 256 colors at 1,280 by 1,024 resolution.



The Ariel 486DX2-66EVS: A power server.

The Ariel 486DX2-66EVS also comes with an 877MB Toshiba SCSI hard disk, a 15-inch ViewSonic 15 monitor, MS-DOS, Windows, and a choice of Borland application software.

- List price: *Ariel 486DX2-66EVS*, \$4,995. *Ariel Design Inc.*, 145 Webster St., Hanover, MA 02339; 800-952-7435, 617-982-8800; fax, 617-982-9095. Circle 410 on reader service card

NEW

Yamaha Ships External MIDI Sound Solution

Yamaha Corp. of America, makers of PC sound chips, has stepped out from behind the curtain to deliver Yamaha Hello!Music!, an external sound solution for multimedia applications that doesn't require an expansion card because it attaches to your

BRIEFS

SOFTWARE UPGRADES

patible with the ability to recover data from DOS 6.0 compressed drives and read/restore DOS 6.0 backups. The new Norton Desktop also supports Windows for Workgroups, and its virus detection program hunts down 100 new strains. The program is available for \$99 with the purchase of DOS 6.0. 800-441-7234, 408-252-3570

Iterated Systems' desktop publishing tool, *Images Incorporated III* (\$299), now has advanced compression technology, OLE support, and support for Fractal Transform Template (FTT) files. FTT files identify related regions within a group of images to improve compression and image quality for the group. A new Archive Mode further compresses fractal files by 10 to 20 percent. 800-437-2285, 404-840-0310; fax, 404-840-0806.

Power Up Software Corp. is shipping Version 3.0 of its desktop publishing software, *Express Publisher for DOS* (\$99.95 through June 30). The most important enhancement is the Layout Advisor feature, which guides you through the design of a layout, giving you a thumbnail view of the document as you explore layout options. Layout Advisor automates tasks such as setting up a grid system and selecting matching typefaces. 415-345-5900; fax, 415-349-1356

CE Software has announced *Quick-Mail*, Version 2.6 (\$649 for 10 users), an update to the company's cross-platform e-mail system that supports Apple's Open Collaborative Environment and Novell's Message Handling Service. A variety of tools have been installed to aid the system administrator, including the ability to work on the server remotely. 515-224-1995; fax, 515-224-4534.

HARDWARE

DynaPoint is shipping the Cordless DynaMouse (\$89.95), an infrared cordless mouse, which lets you control your PC's various interfaces from distances up to 6 feet away and at 90-degree angles. A receiver replaces your regular mouse and sits on your desktop to receive signals from the battery-operated

PC's serial port. At the heart of the system is the Yamaha CBX-T3 Tone Generator, a compact module that provides 192 instrument sounds, 10 drum kits, and digital reverb. It features a MIDI interface that is interchangeable with MS-DOS, Macintosh, and laptop PCs by flipping a switch, and it's fully MIDI compatible so you can access preprogrammed libraries of MIDI music. The CBX-T3 can also act as a connection between your PC and another MIDI device and can accept audio input from any audio device, including a portable tape/radio player, a CD player, or even a microphone.

Hello!Music! comes with Turbo Trax software from Passport Designs. It includes a music recorder for entering notes, a MIDI Player for mixing and editing music, and a selection of preprogrammed tunes. Yamaha CBX-S3 Speakers and the Yamaha CBX-K3 Keyboard are available separately for \$299.95 and \$399.95, respectively.

- List price: *Yamaha Hello!Music!*, \$449. *Yamaha Corp. of America, Consumer Products Division*, P.O. Box 6600, Buena Park, CA 90622-6600; 714-522-9240.

Circle 408 on reader service card

NEW

Command View Creates Universal Toolbars for Windows Apps

Toolbars are all the rage in Windows apps, but what if you can't remember what every iconic button on every toolbar in every app means? **Artist Graphics** proposes a solution with its *Command View*, Version 2.0, a universal toolbar for Windows applications that pops up when you click the right mouse button. It can be customized for each application while maintaining common icons for routine tasks. Any Windows application can be assigned to a button on each Command Pad. When you start a new application, the Command Pad that you've assigned to it appears the next time you hit the right mouse button.

There's a keyboard override so that *Command View* doesn't conflict with applications such as Excel, and icons can be used from any Windows program. The number and size of the buttons are user-definable—Command Pads can measure up to 12 buttons wide by 10 buttons deep—as are the icons themselves. Over 500 bitmapped icons and 20 Command Pads are included to get you started.

- List price: *Command View, Version 2.0*, \$49.95. *Artist Graphics*, 2675 Patton Rd., St. Paul, MN 55113; 800-627-8478, 612-631-7800; fax, 612-631-7802.

Circle 409 on reader service card

ONLY THE STRONG SURVIVE

Rated #1 Overall
"THE QUEST FOR
THE BEST PC"
Feb. 1993



“Performance that tops that of other DX2/50s and rivals that of some of the 66MHz 486DX2s.”

“This Best Buy came up with the combination of performance, price, expandability and design it takes to deserve first place among 25 systems...” — *PC World* February, 1993

“Needless to say the (AcerPower 486e) took first place in every test.” — *PC World* January, 1993

Based on DX/33, DX2/50 and DX2/66 Intel® processors, AcerPower™ delivers plenty of speed and performance for today's demanding Windows® applications. But don't



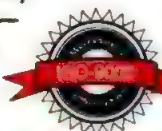
take our word for it—pick up the February issue of *PC World* and find out why the AcerPower 486e DX2/50 is a Best Buy.



In today's aggressive business environment, long-term survival is a matter of strength. And nowhere is this more true than in the computer industry.

Size is strength. With annual revenue of over \$1.2 billion, Acer is one of the world's ten largest PC manufacturers. And with 50 international offices and 10,000 dealers in 70 countries, Acer systems are available around the world. Our global presence allows us to provide an unsurpassed level of service and support.

Self-reliance is strength. At Acer, we don't rely on other manufacturers to build our computers—we make Acer systems out of Acer components. This allows us to ensure quality and pass the savings along to our customers.



Benefit from our strength. Quality. Acer was one of the first to receive the ISO 9002 award—the most coveted award of manufacturing quality and excellence. Affordability. You get the widest range of top-quality computers at the most affordable prices.

So if you're concerned about the long-term survivability of your computer manufacturer, depend on a company that has the strength to endure. Depend on Acer. Only the strong survive.

FEATURES	MODEL 5367	MODEL 5567	MODEL 5667
CPU	486DX/33	486DX2/50	486DX2/66
MEMORY	4MB, Exp. to 256MB	4MB, Exp. to 256MB	4MB, Exp. to 256MB
CACHE	128K	128K	128K
HARD DISK	240MB	240MB	240MB
FLOPPY	3 1/2"	3 1/2"	3 1/2"
ACCEL. VIDEO	Local Bus (1280x1024)	Local Bus (1280x1024)	Local Bus (1280x1024)
I/O	EISA	EISA	EISA
MONITOR	15" NI EVGA .28 Flat Square Overscan	15" NI EVGA .28 Flat Square Overscan	15" NI EVGA .28 Flat Square Overscan
SOFTWARE	DOS®, Windows™	DOS, Windows	DOS, Windows
WARRANTY	One Year On-site	One Year On-site	One Year On-site
MSRP	\$2,599	\$2,799	\$2,999

Acer

ONLY THE STRONG SURVIVE

Call 1-800-SEE-ACER for a distributor or reseller near you

Acer, the Acer logo and AcerPower are trademarks of Acer America Corp. and Acer, Inc. 1486 and the Intel Inside Logo are trademarks of Intel Corporation. All other trademarks are the property of their respective owners. © 1993 Acer America Corporation. CIRCLE 034 ON READER SERVICE CARD

NEW

New Panasonic Notebooks Have Disk Compression, PCMCIA Slot

Panasonic Communications and Systems Co. has announced two new notebook PCs, the CF-580 (monochrome) and the CF-580C (active-matrix color) that utilize Intel's 3.3-volt 486SL processor and nickel metal hydride batteries for up to 4 hours of continuous operation. A subbattery holds data in memory even when the main battery is removed. Both come with a 120MB hard disk, which can be doubled using the SuperStor disk compression software that's already installed, and a PCMCIA Type 2 slot for LAN adapters, modems, or RAM cards. A trackball sits above the keyboard, and the display tilts 180 degrees and supports simultaneous external display.

- List price: *Panasonic CF-580*, \$2,899; *Panasonic CF-580C*, price not yet available. *Panasonic Communications and Systems Co., Two Panasonic Way, Secaucus, NJ 07094; 800-742-8086, 201-348-7000.*

Circle 412 on reader service card

NEW

Transverter Pro: Graphics File Sharing Across Platforms

TechPool Software has released *Transverter Pro*, a software-only solution for importing graphics files from DOS, OS/2, NeXT, and Unix platforms into Windows and Macintosh applications by utilizing a built-in PostScript-equivalent interpreter. To create a universal graphics file you print the file to disk using a PostScript printer driver, then *Transverter Pro* accesses the files and converts them so they can be imported into all programs. Other PostScript-compatible interpreters, such as *Color-Age's Freedom of Press*, are raster image processors (RIPs) that convert PostScript data to either bitmapped files, like TIFF files, or to raster data for printing. *Transverter Pro* can also perform as an RIP.

Transverter Pro supports ATM Type 1 and Type 3 fonts and is compatible with major network operating systems. It can translate between vector formats such as Adobe Illustrator, EPS, and PostScript, as well as convert vector formats to bitmaps like .BMP, .GIF, .PCX, TIFF, .TGA, and Group 3 Fax.

- List price: *Transverter Pro for Windows*, \$395. *TechPool Software Inc., 1463 Warrensville Center Rd., Cleveland, OH 44121-2676; 800-925-6998, 216-291-1922; fax, 216-382-1915.*

Circle 411 on reader service card

BRIEFS

HARDWARE

mouse. 818-854-6440; fax, 818-854-6444

Extended Systems has announced four new PocketPrinterServers (\$495 to \$895) that support TCP/IP, Microsoft LAN Manager, and VINES. The ESI-2831A, ESI-2832A, and ESI-2836A connect to Ethernet networks, and the ESI-2850A connects to a Token-Ring network. Each PocketPrinterServer lets you connect a parallel printer anywhere on the network, eliminating the need to chain the printer to a file server or dedicated workstation. 800-235-7576, 406-587-7575; fax, 208-377-1906

Mustek's PrinScan 105 (\$299), the scanner adapter system that plugs into your parallel port, is now Twain-compliant and lets you scan in both DOS and Windows. It ships with the Matador 105 gray-scale scanner; ScanKit for Windows, Version 2.1; ScanKit Gray for DOS; and Perceive Personal OCR. 714-453-0110; fax, 714-453-1010.

Video Seven has introduced the Win.Swift family of video boards for 16-bit ISA operation (\$179) and 32-bit VESA local-bus operation (\$209). The boards, based on Cirrus Logic's CL-GD5426 controller, feature 1MB of DRAM, a 1,280-by-1,024 resolution, and a wealth of drivers. 510-656-7800, fax, 510-659-9285

Notebook upgrade vendor **Laptop Solutions** has introduced a 2.5-inch, 260MB hard disk upgrade for all notebook PCs (\$1,495). You make an appointment with Laptop Solutions, send them your notebook, and the company performs the upgrade and transfers all your data. 800-683-6839, 713-789-0878; fax, 713-789-8177.

SyDOS has announced the Pro-Note (\$899), 2.5-inch 42MB external removable cartridge Winchester disk drive for portable PCs. The 1.8-inch high drive, with a 14.5 ms. average seek time, connects to the PC's parallel port and has a pass-through connector so you can keep printing. Additional 42MB cartridges cost \$239. 800-437-9367, 407-998-5400; fax, 407-998-5414.

NEW

OS/2 Utility Displays Audio, Image, and Video Files

Commix SP's new 32-bit OS/2 utility, *DisplayMaster*, lets you browse audio, image, and full-motion files simultaneously on-screen. With *DisplayMaster* you can view all the images on a Kodak Photo CD disk in thumbnail sizes and convert the images to common formats. Each window open in *DisplayMaster* has its own set of controls, and the number of DVI, audio, and image windows open at one time depends on the amount of free resources. If you need to annotate files, *DisplayMaster* will save comments made on any of the files it reads, which you can recall at a later time to review or use as presentation tools.

- List price: *DisplayMaster*, \$49.95. *Commix SP Inc., 8201 Greensboro Dr., #451, McLean, VA 22102; 703-356-9858; fax, 703-356-6148.*

Circle 413 on reader service card

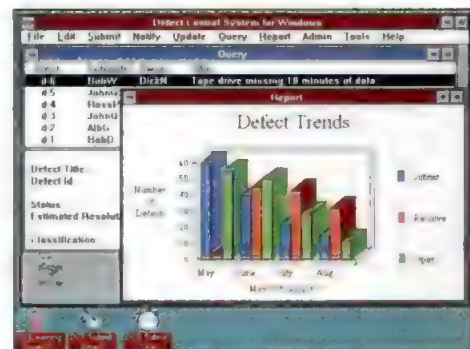
IMPROVED

DCS Finds Bugs As You Program

The Software Edge is shipping *Defect Control System (DCS)*, Version 2.0, a Windows-based app that gathers bug information during software development. DCS guides you through entering bug information, keeps an audit trail, notifies your coworkers of new bugs or updates, classifies bugs for easy querying, and generates trend reports to predict release dates, detect bad code, and forecast customer failure rates. DCS provides field-level security and supports importing bug records from your current database and exporting DCS records to databases, graphics files, spreadsheets, and word processor files.

- List price: *Defect Control System for Windows, Version 2.0*, \$695. *The Software Edge Inc., 4420 Laven Way, Colorado Springs, CO 80920; 719-598-3713; fax, 719-598-3970.*

Circle 415 on reader service card



Defect Control System tracks bug information.

Seagate's 200 MB ST3243

Very Affordable. Very Available.



Seagate introduces the high capacity disc drive that won't tax your budget—or your patience.

The 214-megabyte ST3243A gives you the capacity to handle today's most popular software programs, with room to grow. And with the latest advances in technology and manufacturing, we can sell it at a very pleasing price.

This 3.5" low-profile drive features an embedded AT interface and a data transfer rate of 6 MB per second. Combined with

the low price, the ST3243A represents one of the best values you'll find in the computer industry this year.

And you will find it. Because whether you need one or one-thousand, the ST3243A is available today. For complete product specifications call Seagate at 408-438-8111, or contact your Authorized Seagate Reseller. But don't wait too long. When something very desirable is very affordable, they tend to go very fast.



People who choos instead of 1-2-3's 3-

User's Guide
Worksheet Analysis, Excel

Function R

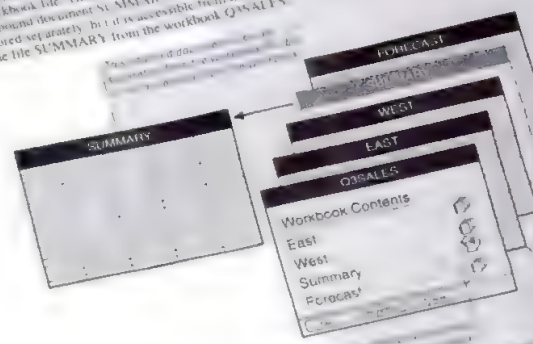
Microsoft

Managing Documents with Workbooks

Organizing your Microsoft Excel documents into workbooks makes it easy to manage your document files and keep related information together. By opening or closing a single workbook document, you can open or close all of the documents you need for a specific task.

A workbook is a type of Microsoft Excel document in which you store other documents. Information about other documents is stored in a workbook file. A document stored in a workbook file is bound in the workbook. An unbound document appears in a workbook's list of documents, but the document file itself is stored outside the workbook file.

The following illustration shows bound documents and an unbound document of a workbook file. The bound documents are stored in the workbook file Q:\SALES. The unbound document SUMMARY, however, is not stored in the workbook file. It is stored separately, but it is accessible from the workbook. That is, you could work with the file SUMMARY from the workbook Q:\SALES.



While bound documents such as EAST can be bound in only one workbook, unbound documents such as SUMMARY can appear unbound in several workbooks at a time.

Excel's Workbook is great for anyone considering going back to school. You get a whole new set of rules to learn.

Excel's Workbook Do have a lot to learn.

The first thing they'll have to learn is an extensive set of new commands and procedures.

Because unlike 1-2-3's 3-D, which lets you work just like you do in 1-2-3's 2-D, Excel's Workbook has a whole new set of rules.

The second thing they'll learn is that Microsoft® Excel doesn't really have 3-D architecture. Instead, it takes separate 2-D worksheets, each saved separately in its own file, links them and stores them together in what they call a Workbook.

1-2-3's true 3-D architecture, on the other hand, actually lets you work multiple worksheets, tightly integrated, in one file.

Because they are in one file, it's easy to create formulas, graphs and formatted reports that actually function across individual worksheets.

2-D can look like 3-D, but...

It doesn't take long to learn what you're giving up.

Because Excel's 2-D worksheets are each in their own file, it's more difficult to work with them together.

So while 1-2-3's GROUP mode stays in effect as you move from sheet to sheet, Excel's shuts

off every time you move to another sheet.

While 1-2-3® users can assign range names and formulas across 3-D ranges, Excel users can't.

While 1-2-3 users can graph 3-D data in one step, Excel users can't.

While 1-2-3 users can create 3-way what-if tables, Excel users are limited to 2-way tables.

And while 1-2-3 is fully compatible with 1-2-3 for DOS 3-D files, Excel is not.

Compared to true 3-D, Excel's Workbook process is invariably more complex, less intuitive, more work intensive, and because everything is done through data links, slower.

In fact, it can take Excel 10 times longer than 1-2-3 to recalculate a multisheet file.

Learn now. Save time later.

It boils down to this. A 2-D spreadsheet is not a 3-D spreadsheet. 1-2-3 is true 3-D. And you already know how to use 1-2-3.

To realize the powerful benefits of a 3-D spreadsheet for Windows™, visit your Lotus Authorized Reseller. Or call for your free demo disk and Lotus White Paper on the benefits of 1-2-3's 3-D architecture, at **1-800-TRADEUP, ext. 8870**, today.*



Lotus

1-2-3 Release 1.1
Spreadsheet for Windows

THERE'S NEVER BEEN A BETTER
TIME TO FOLLOW THE LEADER.
INTRODUCING THE HOT NEW
LEADERS™ FROM PC BRAND.



The new PC Brand *Leader VLB* series can be described in two words. THE BEST. Perfectly matched top components for high-quality

FAST video, *FAST* disks and *FAST* memory. The all-new design features 2 VLB (VESA Local Bus) slots with a high-speed VLB video card. Even an optional high-speed IDE VLB disk controller that boosts disk performance over 100%! Also 6 ISA, 16 bit slots, RAM expandable to 32MB and the ability to easily upgrade processors all the way to the super-fast Pentium™ OverDrive™. All this at prices that have the competition scrambling! Order direct, it's the best deal we've ever offered!

Leader VLB

Leader VLB	386/SX-33	486SX/25	486DX/33 VLB	486DX2/50 VLB	486DX2/66 VLB
Processor Upgradable			•	•	•
Memory Cache	2MB	4MB 128k	4MB 128k	4MB 128k	4MB 128k
Hard Drive	105MB	105MB	170MB	170MB	215MB
Windows Accelerator		Yes/1MB	Yes/1MB	Yes/1MB	Yes/1MB
1.44MB FDD	•	•	•	•	•
1.2MB FDD			•	•	•
32 Bit VESA Local Bus Slots		Yes/2	Yes/2	Yes/2	Yes/2
14" 1024x768 Monitor	•	•	•	•	•
Mini Desktop Case	•	•	•	•	•
RAM Expandable to 32MB	•	•	•	•	•
Write through RAM cache expands to 256K	•	•	•	•	•
101-Key Keyboard	•	•	•	•	•
Serial Mouse	•	•	•	•	•
MS-DOS 6 & Windows	•	•	•	•	•
CompuServe	•	•	•	•	•
Toll-Free Technical Support	•	•	•	•	•
One Year Limited Warranty	•	•	•	•	•
30-Day Money Back Guarantee	•	•	•	•	•
PRICE	\$999	\$1295 With Local BUS \$1499	\$1795	\$1895	\$2095



LeaderBook Lite



LeaderBook Pro

Ergonomically designed to be the ideal Windows notebook. A Centered Trackball and palm rests allow right or left handers to work comfortably without fatigue. And, it comes loaded with all the most wanted features.



486SX/25 or 486DX/33 processors ♦ 4 MB RAM ♦ 80 or 120 MB HDD ♦ 1.44MB, 3.5" floppy
Choice of Monochrome (13:1 contrast ratio, 10" screen), Dual Scan Color (10" screen), or the Active Color (8.5" screen) ♦ All models support external monitor resolutions up to 1024 x 768 x 16, 800 x 600 x 256 ♦ 1 parallel port & 1 serial port ♦ Locking dual Ni-Cad batteries and power adapter
Full size keyboard with separate "PgUp" and "PgDn" keys, a total of 84 keys ♦ Ergonomic palm-rest and trackball, keyboard tilt feature ♦ 12 function keys ♦ External keyboard port ♦ DOS 6 & Windows 3.1 pre-loaded ♦ 9.2" x 11.3" x 1.9", only 6.6 pounds ♦ carrying case

ADDITIONAL OPTIONS

FAX/MODEM ♦ 200MB HDD ♦ Auto adapter ♦ Extra Ni-Cad batteries ♦ Memory expansion cards

CONFIGURATION	MONOCHROME	DUAL SCAN COLOR	ACTIVE COLOR
486/SX-25 4 MB RAM 80 MB HDD	\$1695	\$2395	\$3295
486/DX-33 4 MB RAM 80MB HDD	\$1995	\$2695	\$3595

SPECIAL

8MB RAM
120MB HDD
FAX/MODEM

ADD ONLY \$499 FOR THE POWER BUNDLE!

• Major credit cards, checks, money orders, direct wire and approved purchase orders accepted • Free one-year on-site service on desktop systems is available to most locations in the U.S. • PC Brand reserves the right to amend specifications & prices without notifications • All non-PC Brand products and services are identified by trademarks or other service marks of their respective companies • Computer screens simulated

© PC Brand 1993

► The new **LeaderBook Lite**. Nearly twice as fast as non-486s at half the weight! True desktop power on the road, AND it fits in your briefcase. Expandable and easy to work on (with its extra bright display). Unbeatable features at a great price.

\$1495

486SLC processor ♦ 4 MB RAM ♦ 80MB Removable Hard Drive ♦ Fast response, high contrast (18:1), backlight, 7.4" VGA display ♦ 9.7" x 7" x 1.5" ♦ **Only 3.7 pounds**
♦ Removable battery, provides up to 4 hours operating time ♦ Comfortable 81-key keyboard with inverted "T" cursor control keys ♦ One PCMCIA (Type II) slot ♦ 1 serial and 1 parallel port ♦ External keyboard port ♦ External monitor port, supports external resolution of 1024 x 768 and simultaneous LCD and CRT display ♦ Built-in Trackball
♦ DOS 6 & Windows 3.1 pre-loaded ♦ carrying case

ADDITIONAL OPTIONS

Memory expansion cards ♦ 120MB HDD ♦ Extra batteries ♦ PCMCIA LAN adapter ♦ PCMCIA Fax/Modem ♦ External 3.5" floppy drive

PC BRAND™

The People's Choice.

1-800-PC BRAND

To Expedite Your Call, Please Reference Ad Code #211S
Or 1-800-722-7263 FAX 1-805-378-7801 OUTSIDE US 805-378-7848
IN MEXICO 207-9847

Sales Hours M-F 7am-9pm Sat 9am-5pm Central Time
Or FAX us anytime at the number listed for our latest quotes



CIRCLE 029 ON READER SERVICE CARD



LOTUS cc:MAIL

Awards (1992-1993)

ComputerWorld I/S Brand Preference
Winner, February 1992

Windows Magazine WinAward, February 1992

LAN Times Reader's Choice, March 1992,
January 1993

InfoWorld Product of the Year, March 1992

BYTE Magazine Reader's Choice, June 1992

BYTE Magazine Award for
Cross-platform E-Mail, March 1993

Network Computing's Certified Interoperable
Application Award, December 1992

Network World's Enterprise
Technology Award, December 1992

Software Digest's Highest Overall Evaluation,
8.7 Rating, 1992

MacUser Editors' Choice Award, 1992

MacWEEK 1992 Editors' Choice
Diamond Award, December 1992

UNIX World's Best Product of the Year for
1992, January 1993



MICROSOFT MAIL

Awards (1992-1993)

PC Magazine Editor's Choice Award
October 27, 1992

In the e-mail arena, this is what they call running up the score.

With over three million users, Lotus® cc:Mail® is overwhelmingly the e-mail of choice. In reality, there's no competition.

According to independent reviewers, cc:Mail is the fastest e-mail to learn, the easiest to use, and the smoothest to administrate.

cc:Mail's open architecture means it runs virtually anywhere on anything. Unlike other e-mail products, cc:Mail works with whatever software and hardware you have on board. Across any combination of Macs®, DOS, Windows™, OS/2®, UNIX®. Across LANs, WANs, public or private e-mail forums or unique operating systems. And cc:Mail always lets you work

in the environment you're used to.

Unlike Microsoft® Mail, cc:Mail is built for scalability. It maintains peak performance whether you connect 5 or 500,000 users.

Now that you know the score, it's time to make your call. Just dial **1-800-448-2500** for a free demo disk. And ask for the version of your choice: Macintosh®, Windows, DOS or UNIX.

And see how cc:Mail can put its points in your favor.

Lotus cc:Mail

Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Carol Levin

Polish Your Artistic Skills With CorelDRAW Experts

BY LUISA SIMONE

CorelDRAW is chock-full of easy-to-use tools and automated special effects. But in and of themselves, these powerful features don't guarantee you great drawings. They don't teach you basic drawing skills. They don't explain the difference between vector and raster file formats. And they don't warn you of the inevitable problems associated with complex drawings.

For this kind of information, you'll have to turn to one of the many available books about CorelDRAW. Two newcomers in this group take radically different approaches to teaching you the ins and outs of this powerful program.

Steve Rimmer's *Mastering CorelDRAW 3* addresses the needs of novice users by stressing basic drawing skills. Indeed, the best exercises in the book focus on line drawings—the backbone of any vector illustration. In the course of these well-constructed projects, Rimmer explains how even seemingly simple drawings can (and should) make use of CorelDRAW's advanced drawing and object manipulation functions. In the first exercise, you will find yourself using alignment, grouping, and duplication functions quite naturally.

Similarly detailed exercises are mysteriously absent from subsequent chapters, which focus on type tools, fill options,

and special effects. But despite the lack of hands-on instruction, these chapters contain first-rate information. Numerous illustrations serve a dual purpose: They help you to understand basic design concepts, and they demonstrate how you can use various options within CorelDRAW to affect your pictures.

While sometimes daunting to read, Rimmer's lengthy technical explanations are a constant reassurance of his personal knowledge of the software. For example, Rimmer

does not merely parrot information about CorelDRAW's 256-character limit for artistic text. He explains how you can overtax system resources even before you hit this limit by choosing a complex typeface, then tells you how to avoid this problem. Impatient artists can use the Fast Track crib sheets (synopsized instructions on the most frequently used tools and functions) or handy tip boxes to brush up on basic skills or troubleshoot problems.

Two companion disks contain files of winning CorelDRAW contest entries, including the now famous picture of Rex the iguana. While readers will find it instructive to disassemble these drawings, they ultimately remain more entertaining than useful.



In contrast, there are several shareware utility programs that can help CorelDRAW users to work smarter. FixFont, for example, automatically changes CorelDRAW's ersatz font names into standard commercial equivalents. Instead of working with Switzerland and Palm Springs, you can work with Helvetica and Palatino.

If you're the type who can learn a product only by actually using it, then consider Jim Karney's newest Corel book, *Power of CorelDRAW!*. Sprinkled throughout the text are simple exercises that help you master specific skills, such as editing Bezier curves. In addition, full-blown design projects give you the opportunity to re-create a logo, an advertisement, or a landscape illustration.



Learn how artist Gary Bouton created this image in *Power of CorelDRAW!*

Karney's task-oriented approach results in design projects that utilize all of CorelDRAW's various tools and functions synergistically. So be prepared to

plunge into fairly complex drawings where you'll be modifying lines, filling shapes with colors and patterns, and managing multiple objects. These fast-paced exercises are not for the timid but can help already-competent users advance to a new level of proficiency.

Power of CorelDRAW! showcases the work of seven talented artists and uses their original drawings to demonstrate CorelDRAW's advanced features, such as transparent effects, pen-and-ink simulation, and combined bitmapped and vector images. These chapters do not contain step-by-step recreations of the drawings but instead explain the strategies, secret techniques, and old-fashioned hard work used by real artists to make real art.

Mastering CorelDRAW 3 and *Power of CorelDRAW!* are welcome additions to the library of CorelDRAW books. And both books are now being updated for the upcoming release of the next version. Though they teach different lessons, ultimately Rimmer's patient and clear explanations are a perfect foil for Karney's real-world tutorials. □

• **Mastering CorelDRAW 3**, by Steve Rimmer, \$34.95.

Sybox Inc., 2021 Challenger Dr., Alameda, CA 94501; 800-227-2346. ISBN: 0-782-11154-8.

Circle 462 on reader service card

• **Power of CorelDRAW!** by Jim Karney, \$34.95. MIS:Press, 115 West 18th St., New York, NY 10011; 800-488-5233. ISBN: 1-55828-225-4.

Circle 461 on reader service card



Announcing the first network printer



Operating System	Topology
Novell Netware	*Ethernet/802.3 Token Ring (4/16 Mbps)
Microsoft®	*802.3
LAN Manager	Token Ring (4/16Mbps)
Windows for Workgroups	*802.3
Windows NT	Token Ring (4/16 Mbps)
	*802.3
IBM LAN Server	Token Ring (4/16 Mbps)
	*802.3
AppleTalk	Token Ring (4/16 Mbps)
	*LocalTalk
	*EtherTalk
HP-UX**	*Ethernet
SunOS**	*Ethernet
Solaris**	*Ethernet
SCO UNIX®	*Ethernet

*Standard in the HP LaserJet 4Si MX printer. **For operating HP-UX, SunOS or Solaris, a one-time purchase of \$199 in configuration software is required. Adobe and PostScript are trademarks of Adobe Systems Inc. which may be registered in certain jurisdictions. Microsoft is a U.S. registered trademark of Microsoft Corporation. UNIX is a registered trademark of UNIX System Laboratories Inc. In the U.S.A. and other countries. †In Canada call 1-800-387-3867, Ext. 7299. ©1993 Hewlett-Packard PE12353

Multiple environments are no longer worlds apart. Even if you have Novell Netware on one network, HP-UX on another and EtherTalk on a third, the new HP LaserJet 4Si MX printer easily connects across platforms. Automatically.

The HP LaserJet 4Si MX printer comes out-of-the-box preconfigured for multiple environments. There's nothing more to do than plug-and-play. All interfaces are simultaneously hot, making switching so seamless, end-users won't even notice.

What's more, HP's LaserJet 4Si MX printer is ready to handle whatever needs come down the

that adapts to multiple environments.



pike. More operating systems? No problem. As your network system continues to evolve, the capabilities of this printer are no longer just impressive. They're indispensable.

The HP LaserJet 4Si MX printer is loaded with features that define state-of-the-art. HP's enhanced PCL5 and genuine PostScript™ Level 2 software from Adobe™ come standard. Printer environments are saved while switching. Setup is a cinch with network software utilities and drivers included in the box. And, if you need any reassurance about trouble-free operation, you have it in our Simple Network Management Protocol (SNMP) support.

At 17 ppm, this is the fastest LaserJet ever, with I/Os and RISC-based formatter capabilities matched to support its speed. It delivers impeccable 600 dpi print quality—thanks to HP's microfine toner and Resolution Enhancement technology. Plus, it comes standard with two 500 sheet input trays.

But what if you don't need the full capabilities of the HP LaserJet 4Si MX printer right away? HP offers another printer that's probably a perfect fit. The HP LaserJet 4Si printer delivers the identical 17 ppm performance and superb 600 dpi print quality. It also has room to grow. The two MIO expansion slots let you add

HP JetDirect network interface or third party cards. And you can add on Adobe's genuine PostScript Level 2 software and SIMM memory modules, as you need them.

To find out more about the multiple-network HP LaserJet 4Si MX printer and the upgradable HP LaserJet 4Si printer just call 1-800-LASERJET, Ext. 7299.† Capabilities this advanced make a world of difference—in any environment.



**HEWLETT
PACKARD**

"I've Had It. We're Getting Hayes OPTIMAs. They're Affordable. They're Dependable. I Can't Go Wrong."



As modem prices continue to drop, it's important that reliability doesn't. With the OPTIMA™ family, you can count on the quality of Hayes at very affordable prices. Data modems. Data plus FAX modems. Board versions. Even portables. With speeds from 2400 to 14,400 bps, OPTIMA is Hayes quality at a surprisingly low price.

SPECIAL FEATURES. OPTIMA's Automatic Feature Negotiation selects the best combination of data speed, error-control, and data compression for throughputs of up to 57,600 bps to save big bucks on phone charges. Hayes' AutoSync eliminates the need for buying special adapter cards to communicate with PCs and mainframes. And to help avoid problems like data interruption and compatibility,

OPTIMA includes the Hayes patented Improved Escape Sequence with Guard Time and Hayes Standard AT Command Set. Just some of the features that helped Hayes win the Computerworld 1992 I/S Brand Preference



Award in 8 categories.

**NEW
LOWER
PRICES**

EXTRA BENEFITS FOR YOU. All this low-priced reliability is packed with our famous Smartcom™ software to help you communicate easily in minutes. And it's all backed by a fast, efficient Hayes Technical Support team. Call 1-800-96-HAYES for your nearest dealer or product literature. In Canada, call 1-800-665-1259.



Hayes quality, low prices, and peace-of-mind. Think OPTIMA...from Hayes.

Why settle for anything less? Hayes products have the computer world talking. More than ever.



Go Online with Hayes BBS; call 800-874-2937 or 404-446-6336.

© 1993 Hayes Microcomputer Products, Inc. P.O. Box 95203, Atlanta, GA 30348. Hayes, the Hayes logo, OPTIMA, Smartcom, and the Hayes' '802 Escape Sequence Patent icon are trademarks of Hayes Microcomputer Products, Inc.

CIRCLE 136 ON READER SERVICE CARD

Toolkits

REVIEWS OF THE LATEST TOOLS FOR THE PC PROGRAMMER

Edited by Trudy Neuhaus

Make Your DOS Programs Sing with WORX 2.01

BY J.W. OLSEN

These days, even your best programs can seem anemic when compared with other software, simply because they lack music, digitized voices, and other sound effects. Perhaps you've given up on some sound libraries because they are too complex, demand excessive system resources, or require royalties for each copy of your program that you distribute. If so, give your DOS programs new vigor with WORX Toolkit, Version 2.01.

Written in assembly language, WORX is equally at home in Microsoft C/C++, Borland C++, Turbo C/C++, or Turbo Pascal environments. Once installed, this royalty-free, linkable library demands about 15K of RAM—but not for long. As you'll see in a moment, you can recoup this RAM, plus any memory allocated to buffers (which varies according to your own programming needs), through a clever "resource-file" strategy. This strategy shuttles data for sounds and other objects into memory from what the documentation calls *resource files*.

The function library is so well crafted that the only clues that publisher Mystic Software is a newcomer to the field are modest packaging and some omissions in the documentation. Without a word in the printed manual about installation, you are left to your own devices to get the software up and running. Copying files to my hard disk proved insuffi-

cient, yet logging on to the distribution disk and running INSTALL worked only in a fairly bare environment: Once I closed Windows 3.1 and deactivated Central Point Anti-Virus, the INSTALL program was successful. Thereafter, I found that the supplied batch files which adapt the toolkit to a particular compiler weren't entirely compatible with the directory structure that INSTALL created. Finally, one sample program wouldn't compile within Turbo C's integrated development environment because it contained in-line assembly code.

Moderately experienced developers will work around these shortcomings, manage without a tutorial in the documentation, and soon be running at top speed. However, getting started will be somewhat challenging for novices; Mystic would do well to devote a bit more of its development resources to making its product friendlier for novices.

Don't be dissuaded from an otherwise-fine toolkit for these oversights, however. The 35-function library is so inviting and solidly designed that it is worth the start-up nuisances. With barely a look at the documentation and sample files, I had my screen-saver utility cheerfully playing a background tune in minutes.

Unlike its competitors, such as the Creative Labs FM-Driver, WORX does not re-

quire a device driver or stay-resident module to perform its magic; it simply links into your code—a welcome approach for novice and experienced developers alike. Then, with a minimum number of function calls, your program can play standard MIDI (formats 0 and 1) and .CMF files. (Creative Music Files—.CMF—use a format from Creative Labs and Creative Technology.) The product also supports a standard sound bank for the Roland MT-32 MIDI synthesizer, which can be customized on the fly. So playing a sequence is just a matter of loading and playing.

Digitized .VOC files (Creative Labs' sound-file format) are also supported, and may even be played simultaneously with MIDI or .CMF files. Long .VOC files should be accessed from a hard disk to conserve memory. (Floppy-disk access is too slow for satisfactory results.) Shorter .VOCs can be loaded into memory—which is particularly handy for repeated play, such as sound effects in games.

Though primarily designed for Sound Blaster and Sound Blaster Pro (DSP 2.0 or higher for .VOC files), WORX Toolkit, Version 2.01, adds support for ordinary PC speakers—albeit with their predictably poor quality. Mystic's toolkit includes a utility to convert .VOC files into the Pulse Width Modulation files suitable for PC speakers.

If your programs contain or require extensive sound, graphics, text, or other data, WORX's Resource Manager will delight you. In effect, this utility merges virtually any type of data into

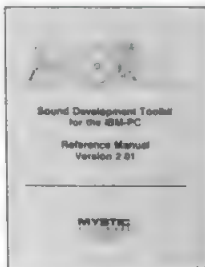
a single WORX resource file, from which you can readily extract elements on demand. Thereafter, your program can access any element within the resource file just as though it were an ordinary disk file. In fact, WORX functions look first for a resource file and search it for the desired "file." If not found, the directory is automatically searched for a conventional file by the same name.

The resource file concept greatly simplifies the distribution and installation of programs, as just one file can replace numerous separate files, often saving disk space in the process. But most important, maintaining all data in a single file significantly reduces access time, since your program needn't wade through directories for each element as needed. At the same time, your program requires less RAM, unburdened from loading text and so on until actually needed. After use, data buffers can be discarded. As a bonus, you needn't worry about closing individual files or about end-of-file markers; the Resource Manager handles these details for you.

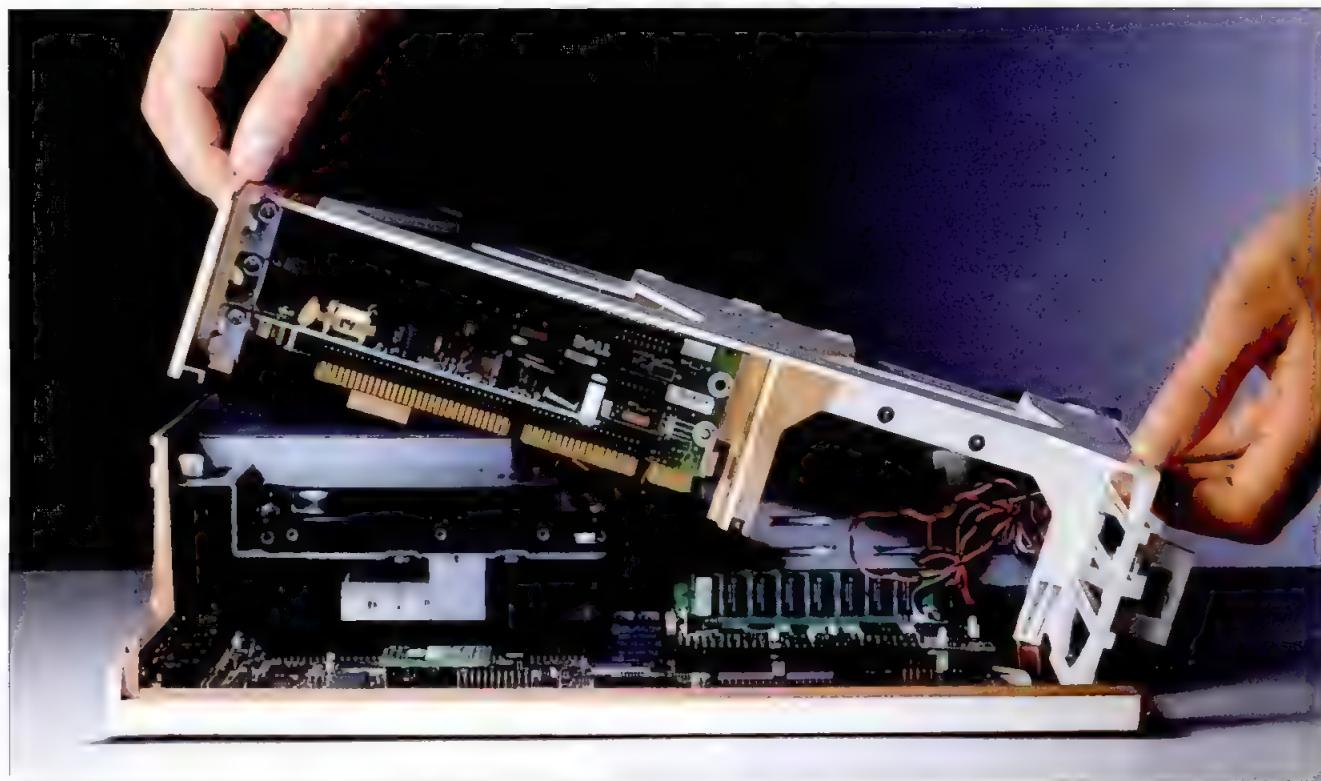
Mystic is currently enhancing WORX to embrace additional sound cards and sound-file formats; some of these enhancements are expected to be supported by the time you read this. But for a reasonable \$79, which includes unlimited future upgrades and technical support, why wait? □

• **WORX Toolkit, Version 2.01**
List Price: \$79. Requires: *Microsoft C/C++, Borland C++, Turbo C/C++, Turbo Pascal, or an assembler. Mystic Software, 1504 Encinal Ave., Suite D, Alameda, CA 94501; 510-865-9189; fax, 510-865-9563.*

Circle 451 on reader service card



PRETTY EASY.



DELL 486/L SERIES



The Dell® 486/L has embedded diagnostics that can identify a problem component just by pushing the reset button twice. Even if a major component like the monitor or hard drive isn't working, a video display or beepcode will tell you the exact problem.



The Dell 486/L comes apart easily by first taking out two thumbscrews and removing the chassis cover. That's right, you don't need a hammer. Crowbar. Or a chainsaw.



Just push two buttons (you won't need an M.I.T. degree for this either), unplug two cables, and slide out your diskette drives for easy upgradeability or service. Or to add a tape drive or CD-ROM drive.



Then all you do is remove one tiny, little screw and pull out the entire card cage to add different user upgrade options like video memory. You can also add cache. Add Pentium™ technology. Change the processor. Or even swap out the system board. A child could do it. Or even your boss.

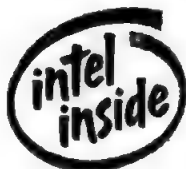


Or if you want to get to your hard drive for easy maintenance or for an upgrade, just take out another screw, unplug two cables, and snap it out.

If you need to remove a hard drive on a Compaq ProLinea System, it's not a pretty picture. And getting to the system board can be downright frightful.

Not so with the Dell 486/L series. In fact, it's the world's easiest PC to take apart. To remove the hard disk of any one of the L Series systems, take out one screw with a standard screwdriver. Access the Dell system board just by removing our unique expansion card cage, with network cables intact.

To remove our competitor's hard drive, take a crack at five screws with a



THE DELL 433/L i486™ DX 33MHz SYSTEM

\$1,899

BUSINESS LEASE*: \$70/MO.

- 4MB RAM • 170MB (17ms) HARD DRIVE • 3 ISA EXPANSION SLOTS • UPGRADEABLE TO PENTIUM TECHNOLOGY • ACCELERATED LOCAL BUS VIDEO WITH 1MB VIDEO RAM • SVGA 1024I MONITOR (14", 1024 x 768, .28mm)
- ONE DISKETTE DRIVE (3.5" OR 5.25") • MS-DOS® 6.0

Many other L Series system configurations available.

*Guarantees available in USA only for registered owners of Dell Performance Series systems purchased after 7/1/92. For a complete copy, please call our TechFax™ line at 1-800-950-Group, Inc. *On-site service provided by BancTec Service Corporation. On-site service may not be available in certain remote locations. The Intel Inside logo is a registered trademark and i486 and

PRETTY UGLY.



COMPAQ PROLINEA

T15 Torx screwdriver. (No, your local grocer probably won't have one.) And to access the system board, should you decide to accept this mission, you may have to disconnect all of the cables, then remove the expansion cards, then replace the expansion cards, then reconnect all the cables.

Dell also has embedded diagnostics that can run even when the system won't boot. You'll never waste your time searching high and low for the diagnostic diskette that came in the box.

Another beautiful thing about Dell is the service

guarantee* ensuring you on-site service by the next business day.² Which may be why we're the leader in customer satisfaction.

Why not order one right now? That's pretty easy, too.

DELL™

800-626-4310

WHEN CALLING, PLEASE REFERENCE #118FE

HOURS: 7AM-9PM CT MON-FRI, 8AM-4PM CT SAT, 10AM-3PM CT SUN.

IN CANADA: CALL 800-668-3021. IN MEXICO CITY: 228-7811.

1329 or write Dell USA L.P., 9505 Arboretum Blvd., Austin TX 78759-7299. Attention: Guarantees. *Prices valid in U.S. only. Some products and promotions not available in Canada or Mexico. ²Leasing arranged by Leasing. Pentium are trademarks of Intel Corporation. MS-DOS is a registered trademark of Microsoft Corporation. Dell disclaims proprietary interest in the marks and names of others. ©1993 Dell Computer Corporation. All rights reserved.

OVER 10,000 ITEMS • 2 RIVERVIEW DR • SOMERSET, NJ 08873 • FAX (908) 302-9730

The Direct Value:

- Over 10,000 Stock Items
- Expanded International Distribution
- Same Day Shipping • No Credit Card Surcharge
- Corporate P.O., A.P.O., F.R.O. and Int'l Orders Welcome
- 24 Hour Automated Order Line

TO ORDER CALL **1-800-777-5014**

SOFTWARE HOUSE DIRECT

Software and Peripherals
at Best Prices and
Full Service

INTERNATIONAL CALLERS USE

1-908-805-0995 (Mon-Fri 8:30AM - 8:30PM EST)



The Wedding Workshop
Introducing the easiest and most enjoyable way to plan and organize your wedding. Includes guest list, budgeting, to do list, print envelopes and/or labels, 116 page wedding planning guide, and much more! Great idea for engagement gift or a bride near to your heart.

Now Only... **\$59**

Microsoft Windows Printing System



The Windows Printing System is the most productive way to print from Windows. It actually extends the power of the Windows operating system to your HP Laser Jet printer. It makes your printing easier and faster than ever. **Now Only... \$129**

MS Windows Sound System... **\$185**

Publisher's Paradise

The 2 most important elements in any document are fonts & graphics. Publisher's Paradise provides both for one low price. The clip art is rich in detail, over 1000 images covering 18 volumes of "PCX" graphics included. The fonts are True Type format - completely scalable with razor sharp edges including 150 fonts from fancy headlines to classic typefaces.

Publisher's Paradise **\$69**

Publisher's Paradise Lite **\$29**

Sampler now available **\$6.95**

Lotus 1-2-3 for Windows

Award winning 1-2-3 for Windows is the full-fledged Windows application with innovations that deliver a wonderful balance of power and simplicity. Not to mention full compatibility with all earlier versions of 1-2-3.



\$319

SOFTWARE

ACCOUNTING

CA-Simply Accounting Win/DOS	117
Intuit QuickBooks	89
Intuit Quickwin Win v2.0	39
MS Money Win v2.0 (Special)	15
Peachtree Complete v6.0	175

BUSINESS GRAPHICS

ABC Flowchart 2.0 Windows	309
Aldus Persuasion v2.1 Windows	319
CA-Crickle Presents (Special)	117
Corel Draw v3.0 Disk & CD	369
Corel Draw Disk & CD Comp Upgrade	319
Lotus Freelance Graphics Win	169
Micrografx Windows Draw (Special)	72
SW Harvard Graphics for Win v1.03	355
SW Publishing Harvard Graphics v3.0	399

CAD

American Design CAD v4.0 3D	234
American Design CAD v6.0 2D	164
Autodesk AutoSketch v3.0 (Special)	85
Autodesk Generic CAD v6.0	269
Autodesk Generic CAD Symbol Libraries	
Architect 1&2, Engineering & Electronic Symbols	(each) 84
Autodesk Generic CAD Symbol Libraries	
Business Symbols (Special)	42
Foresight Draftix Windows Cad v2.1	419

COMMUNICATIONS

Datatorm Procomm Plus for Windows	95
Datatorm Procomm Plus v2.01 (Special)	69
CA/Session (Two PC Pak)	95
Hayes Optima 24/SCEZ v42bis	119
Hayes Optima 96/SCEZ (Special)	339
Hayes Smartmodem 24/SCEZ	264
Hayes Ultra 96/SCEZ v42bis	576
Initial Satisfaction 14.4 Fax/Data	399
Initial Satisfaction 9600/2400 mod 100	99
Microcom Carbon Copy Plus v6.1	127
Smartcom for Windows	95
Symantec Norton PCAnywhere LAN v4.5	299
U.S. Robotics 14.400 FAX/EXT	219
U.S. Robotics 2400 v42 BIS/EXT	115
Zoom 2400BPS w/RPI Hdrwr EXTL	59

DATABASE

Alpha Four 2.1 Comp Upg. (Special)	89
Borland dBASE III Plus v1.1	459
Borland dBASE IV v2.0 (Special)	539
Borland Paradox v4.0	529
Claris Filemaker Pro Win v2.0	329
DB Fast	329
InfoTrac	179
Microsoft R.B.ASE v4.0	439
MS Access Win v1.0 (Special)	89
Superbase IV Windows v1.3	459
Symantec dBase v4.0	249
Word Tech Arango dBase v2.5	529

DESKTOP PUBLISHING

Adobe Illustrator v4.0/Win	409
Adobe Type Fonts (Special)	Call
Adobe Type Manager Plus Kit	119
Aldus Freehand Win v3.1	385
Aldus Gallery Effects Win (Special)	129
Aldus PageMaker v5.0 Win	562
Corel Composition Pro Win v2.1	607
Corel Draw v3.0 Trade Upgrade	169
DeskTop Styles	25
Micrografx Metafont v3.0 (Special)	69
Microsoft PowerPoint v3.0 Win	289
Microsoft Publisher for Win v1.0	120
Microsoft True Type Fonts Pack	44
Quark Xpress Win (Special)	529

CIRCLE 190 ON READER SERVICE CARD

HOME/RECREATION

Access Links 386 Pro (Special)	39
Accolade Hardball III	32
Accolade Jack Nicklaus Signature Ed.	37
Broderbund New Print Shop Companion	29
Broderbund Where in the USA	29
Broderbund Where in Time	29
Casino Master for DOS	39
Crossword Creator	39
Davison & Assoc. New Math Blaster Plus	29
Gamelok Wheel of Fortune/Win	21
Games Master for Windows	27
Meca The Oregon Trail (Special)	27
Meca Word Munchers	15
MS Flight Simulator v4.0	37
MS Golf (Special)	42
MS Golf II (Special)	42
PFS Resume & Job Search Pro	37
Puzzle Master mac	27
SMC Autopark Europe (Special)	75
SMC Orbits (Special)	32
Walt Disney Bundle	27
WordSearch Creator (DOS & WIN)	29

INTERGRADED

Lotus Smart Suite (Special)	425
Lotus Works	89
Microsoft Office for Win v3.0	439
Microsoft Works for Win v2.0	129
Microsoft Works v3.0 (Special)	89

OPERATING SYSTEMS

IBM OS/2 v2.0/Upgrade	99
Microsoft DOS v6.0 Upgrade	129
Microsoft Win 3.1 (Special)	88
Microsoft Win 3.1 Upgrade	47
Novell Netware Lite v1.1	65
Qualitas BlueMAX v6.0 (Special)	74
Quarterdeck Designview 386 v2.4	129

PROGRAMMING

Borland C++ v3.1 w/App From v3.0	489
Borland Turbo C++ for Windows v3.1	102
Borland Turbo Pascal v7.0	102
CA Clipper v5.2 (Special)	467
CA Clipper comp. upg.	139
Microsoft C Compiler v4.0	299
Microsoft Fortran Compiler v5.1	299
Microsoft Visual Basic Win v2.0	119
Windows Teach (Program Windows)	59

SPREADSHEETS

Borland Quattro Pro 1.0 Win/DOS Comp Upg.	92
CA-Competel v4.2	299
CA-SuperCalc v5.5 (Special)	499
Lotus 1-2-3 for Win v1.1 Comp Upgrade	95
Lotus 1-2-3 for Windows v1.1	319
Lotus 1-2-3 v3.0	399
Microsoft Excel v4.0 for Win (Special)	295

TURBO BOOKS

Career Book by Joyce Lain Kennedy	16
Complete Guide to MS DOS 5.0	16
Complete Guide to Windows 3.1	16
Den of Thieves	16
Lost of the Malchans, Dealerslayer	19
On the Road, the Portable Computing Bible	19
Right College (available March 15, 1993)	29

WORD PROCESSING

CA-Textator / Grammatik Bundle	75
Individual Software Resumemaker	29
Lotus AmiPro v3.0 Upgrades (Competitive)	89
Lotus AmiPro v3.0 & 1-2-3 v1.1 for Windows (upgrade)	189
Microsoft Word for Win v2.0	289
Reference Grammatik 5 DOS or Win	55
Software Pub. Corp. Prof Write v2.2	169
WordPerfect for Win v5.2 (Special)	265
WordPerfect v5.2 Upgrade (Var.)	Call



WordPerfect 5.2 for Windows

ships with the popular Grammatik 5 grammar checker, as well as Adobe Type Manager and new fonts. The upgrade includes a new Quickfinder indexing program, support for OLE, better support for Windows printer drives, and is mail-enabled so you can send messages from WordPerfect with your favorite mail package.

Comp. Upg. ...\$99 **\$265**
Version Upg. ...\$77

UTILITIES

Berkley Syst After Dark for Win v2.0	27
Central Point PC Tools v8.0	120
Gold Disk Screen Craze II (Special)	19
PaintCalc	36
PaintCalc/Dashboard Bundle	59
Qualitas 386 Max v6.0 (Special)	59
Quarterdeck Clean 386 v6.0	59
Stoc Software Stacker v3.0/Win	89
Symantec Norton Antivirus v2.1	79
Symantec Norton Desktop for Win v2.0	115
Symantec Norton Utilities v6.01	115
UltraVision Laptop/Desktop	62

PERIPHERALS & HARDWARE

ACCESSORIES

3M DC2 120 Data Cart (Special)	21
Ameri Power Conversion Back-Ups 250	109
Kensington Masterpiece	89
Logitech Desu Mouse w/9-25 Pin Adapter	19
Logitech Mouseman Bus (Special)	69
Logitech Mouseman 5 pak	269
Microsoft Bus Mouse w/Win. Ser/PS/2 Bus	147
Tripp Lite Isobar4 (Special)	45

CONNECTIVITY

3 Com Etherlink II TP Adapter (Special)	215
Eagle Tech NE 1000 Ethernet Card	
8bit/noCbl	96
Eagle Tech NE 2000 Ethernet Card	
16bit/noCbl	132
Stand Micro Sys Ethercard Elite 16 Combo	149
Stand Micro Sys Ethercard Elite 16T	129

MONITORS

ATI VGA Wonder XL24 1MB	139
Goldstar 1460 Plus 14" (Special)	279
Magnavox Super VGA 14" / 28"	319
NEC MultiSync 3FGX Flat Screen 15"	659
NEC MultiSync ZA 14" Super VGA	369
NEC MultiSync 4FG Flat Screen 15"	799
Samsung CVL4955 14" (Special)	229
Samsung Syncmaster 4 17" Super VGA	835

Please call for any item not listed. We have an extensive inventory to cover all your needs. We're a Novell & Lotus authorized dealer.

MULTIMEDIA

Creative Labs Int CD-ROM, SoundBlaster Pro, MS Win 3.1, Speakers Model 200	459
Creative Labs Ext CD-ROM, SoundBlaster Pro, MS Win 3.1, Speakers Model 200	519
Lab Tech Stereo Speakers 100 (Special)	16
Lab Tech Stereo Speakers 200	19
Sound Blaster (Mono) Joystick port MIDI	95
Sound Blaster (Stereo) Joystick port MIDI	189
Sound Blaster MIDI Kit (Special)	59

STORAGE/DRIVERS

Creative Labs CD-ROM Kit Int (Special)	370
Creative Labs CD-ROM Kit Ext (Special)	439
Colorado Mem Systems Jumbo 250MB	207
Iomega Removable 30 Pro External	409
Irvine 250MB Dual Speed Int/Kit	215
Magnavox CM2058KB CD-ROM w/Audio	389
Sygate ST3144A 130MB 3.5 IDE	289
Sygate 88H Internal Removable Cat	485
TEAC 3.5" 1.44MB Floppy Disk Drive	55
TEAC 5.25" 1.2MB Floppy Disk Drive	59
Toshiba 1.2MB 5.25 Floppy	59

PRINTERS/SCANNERS

Canon BJ 10EX Gry/Whl (Special)	299
Canon BJ-300 80 Col 24-Wire	379
Fotomaster Digital Camera	379
Kodak Diconix 180ci Printer Par	224
Kodak Apower Mac Inter Kit	39
Kodak Diconix 180ci Serial (Special)	249
LaserMaster Winjet 800MCA	469
LaserMaster Winjet 1200	729
LaserMaster WinPrinter 600XL	3185
Logitech Scanman 256	256
Logitech Scanman 32	129
Okidata ML-380 Printer (Special)	359
Okidata ML-380 Printer	639
Okidata OK-400P Printer	639
Okidata OK-830 Printer (Special)	1299
Okidata OK-840 Printer	1599
Panasonic KX-P11241 24 Pin/80 Col	299
Panasonic KX-P1180i	149
Panasonic KX-P1654 Dot Matrix	579
Panasonic KX-P1624 Quiet Tech	349

Replacement of defective items. There is a 15% restocking fee on any non-defective, unopened goods returned. Software/Hardware prices may change without notice. \$7.50 hr 2-day, \$25.00 for overnight. Small handling charge applies. Not responsible for typographical errors.



Michael J. Miller

New PCs, New Ways of Working

The PC is dead. Long live the PC. What is dying—or at least changing dramatically—is our definition of the PC. We're seeing new operating systems, such as Windows NT and OS/2. We're seeing new platforms, such as those built on

the Pentium processor, the Digital Equipment Corp. Alpha, and the IBM PowerPC. These developments have already changed and broadened our view of the PC. But the more important changes are even more subtle: New operating systems and new platforms will lead to new ways of working. And new user interfaces, new ways of combining applications, and radically improved networking will change the way we look at the PC.

CHANGING DEFINITION

The definition of the PC has evolved remarkably over the past dozen years. When *PC Magazine* was founded in 1981, the answer seemed obvious: PC meant the IBM PC, Big Blue's 8088-based entry into the microcomputer world. Yes, that term belied years of personal computers made by other vendors, but it seemed to fit. PC meant the IBM PC.

A few years later, the definition evolved to include machines that were compatible with the IBM PC. Companies like Compaq succeeded in creating machines that support all of the popular PC applications and add-in boards. PC meant the IBM PC and compatibles.

In 1984, IBM expanded the PC standard with the PC AT, and a few years later, Compaq and ALR led the rest of the industry with early 386-based compatibles. Other vendors followed suit, and broadened the PC standard with new video, disk drive, and peripheral standards. In 1987, IBM introduced the PS/2 family with its Micro Channel Architecture. However, most of the other computer vendors stayed with the original PC bus design (called the Industry Standard Architecture, or ISA), while others jumped on the EISA bandwagon. Suddenly, PC meant those machines that

were compatible with the PC standard, not necessarily with IBM's computers.

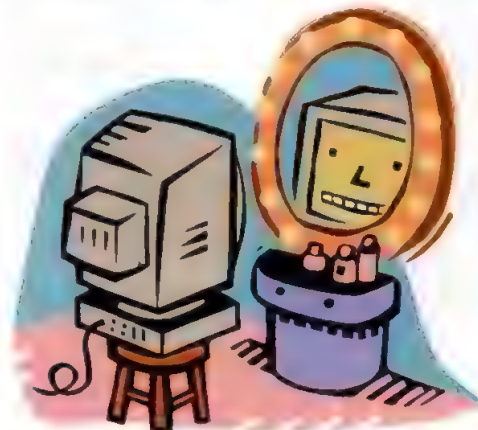
In the late 1980s and early 1990s, the PC standard broadened further, with innovations such as 486 processors, Super VGA, and the IDE standard for hard disks. PC meant machines based on Intel chips running MS-DOS.

Then companies such as AMD and Cyrix introduced chips that were compatible with those made by Intel's x86 line. Operating systems began to proliferate as well. Microsoft Windows gained millions of converts, but Microsoft's operating systems faced competition from products such as DR DOS from Digital Research (later acquired by Novell) and OS/2 from IBM.

PCs moved from being standalone machines to parts of networks, and we began to see standard PCs used as servers, and other machines based on PC components introduced as dedicated servers. In this arena, Novell's NetWare became the dominant operating system, with Banyan's VINES and OS/2-based network operating systems competing.

PC came to mean all sorts of machines based on Intel or compatible CPUs running DOS or compatible operating systems.

Now, even that definition is getting broader. Sensing that DOS is nearing the end of its evolution, many computer users are looking at new choices, such as Windows NT, OS/2, or many of the flavors of Unix that are now being introduced for the Intel architecture. A number of vendors are introducing computer platforms that use new RISC-based CPU designs and portable versions of Windows NT or OS/2. Even within the Intel architecture, Intel itself is incorporating many RISC con-



RISC-influenced superscalar CPUs and portable 32-bit operating systems are changing the PC's image.

Michael J. Miller

cepts, such as executing multiple instructions in a single clock cycle, in its new Pentium chip. All of these machines are being designed to take industry-standard components, such as video systems and disk drives, because they're remaining competitively priced even as they increase in complexity.

In the second half of the '90s and on into the beginning of the next century, PC is destined to mean machines based on incredibly fast RISC-influenced, superscalar CPUs running portable 32-bit, multitasking operating systems.

NEW WAYS OF WORKING

This sounds like a lot of computing power, and it is. Don't worry about how we'll use it, though. Applications always grow to stretch your hardware's capabilities. I expect we'll see advances in lots of areas, focusing on three major trends:

The first of these is the most general: User interfaces are going to get a *lot* better. We've already seen progress in the transi-

tion from character-based programs using function keys to graphical programs with icons and pull-down menus. But that's just the tip of the iceberg. We're seeing programs designed from the ground up to be easy enough to use without opening a manual. The help isn't contained within a book, inside the box, or even in a separate menu system, but on-screen at all times.

Multimedia will play a large role in the evolution of the interface. I expect you'll see computers use audio, video, and animation to give help (Microsoft and Lotus have already started to do this), and as features of the user interface. Alternate-input technologies will also play a part. From handwriting recognition to voice recognition, from pen-based computing to devices that combine the functions of computers, telephones, and televisions, the potential is enormous. These applications will require lots of computing power, and will stress even the next generation of computers.

The second major trend is a move toward more personalized software. Applications will be very customizable, and you'll be able to link them together like building blocks. Macro languages that work across platforms will control these combined ap-

plications. Wizards and agents, which are application-specific today, will automate tasks involving multiple apps tomorrow. Many will run in the background—you may not even know they're there. These too will require powerful operating environments and platforms in order to work.

Third, in the future you will be able to get any information you want, wherever and whenever you want it. You will likely have software that automatically connects you to multiple information sources, from your company's proprietary database to generalized news services to personal electronic mail. Your e-mail and data files may well be sorted and prioritized according to filters that you have preselected. You will be able to be "connected" at the office, at home, and on the road—through desktop computers, laptop computers, and tiny, specialized personal communicators.

Our definition of the PC has broadened immensely over the past dozen years—and it's likely to keep expanding until it covers everything from hand-held electronic personal assistants to consumer information devices to fault-tolerant servers capable of handling thousands of simultaneous users. The PC is entering a new world. □



Get in Shape with NetUtils 3 Data Recovery Software

Start a new fitness routine today using NetUtils 3 - the most powerful workout available for your Novell NetWare 3.x file server. With NetUtils 3 data recovery and protection software, you can run a marathon of functions in record breaking time - from rebuilding corrupt files to recovering them from a downed server!



\$195 suggested
retail price

Data recovery software
with muscle.

Ontrack
CORPORATE SYSTEMS

CA: 1-800-752-7557 • MN: 1-800-752-1333

2400 Main Street, Suite 200, Irvine, CA 92714/714-263-9245 • 6321 Bury Drive, Eden Prairie, MN 55346/612-937-1107 • United Kingdom 44-81-974 5522

CIRCLE 133 ON READER SERVICE CARD

Get a hold of the best value in LAN power protection

Now just \$139!

suggested list price

Blackouts, brownouts, sags...
Your data and hardware are vulnerable to problems that surge suppressors and power directors are just not equipped to handle.

Now there's a complete Uninterruptible Power Supply solution to suit any budget. The Back-UPS™ 250 is reliable protection for LAN nodes, 386SX machines, 286, small PS/2 systems, and internetworking hardware such as routers, bridges, gateways and repeaters.

From the largest server to the smallest router, the Back-UPS Series will increase your productivity by providing a cost-effective solution to power problems. Call for your free power protection handbook.



The **Back-UPS 250** offers even more cost-effective protection for LAN nodes (typical runtime for a 386SX system is 10 minutes).

NEW!



■ **ABSOLUTE™** Protection guarantees repair or replacement of equipment (up to \$25,000) if damaged by a surge while protected by a properly installed Back-UPS (See warranty for details).

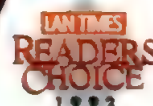
■ UL, CSA and Novell approved with a 2 year warranty

■ Full-time surge protection and line filtering

■ Most models include LAN interface for automatic-shutdown of Novell, LAN Manager, LAN Server, LANtastic, Banyan, SCO Unix, and others

■ Ask about PowerChute® UPS monitoring software and Novell compatible UPS monitoring boards

■ 230V models available



1991, 1990



The Back-UPS™

by American Power Conversion
(800)800-4APC, Dpt. E4

APC 132 Fairgrounds Road, West Kingston, RI (401)789-5735
APC Europe TEL: (+33)1.64.62.59.00 FAX: (+33)1.60.17.80.29

©1992, Back-UPS, PowerChute, Guaranteed ABSOLUTE Protection are trademarks of APC. All other trademarks are property of their respective owners.

**NEW
NEW**

Model	Application	List	New List
Back-UPS 250	LAN nodes, 386SX, 286, internet hardware, POS	\$169	\$139
Back-UPS 400	Desktop 386, 486 systems, 286 servers	\$249	\$229
Back-UPS 450	Tower 386, 486 systems, servers	\$229	\$279
Back-UPS 600	Heavily configured systems, CAD/CAM workstations	\$449	\$399
Back-UPS 900	Multiple systems, longer runtime applications		\$599
Back-UPS 1250	Multiple systems, LAN hubs, small minis, telecom equipment		\$799

CIRCLE 102 ON READER SERVICE CARD

JUST HOW LONG WILL IT BE BEFORE THE OTHER BILLION DOLLAR BRANDS BEAT *our* PRICES?

Don't sit around waiting; it won't happen. We've built our business around giving you the latest technology at the lowest prices. Compudyne is part of CompUSA[®], The Computer SuperStore (publicly traded as 'CPU' on the NYSE), a 1.2 billion dollar enterprise and the nation's largest discount computer chain—due to commitment to huge selection, outstanding service, and low, low, prices.

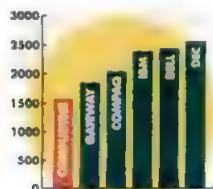


THE LOWEST PRICES ON THE LATEST TECHNOLOGY.



Compudyne's prices are the absolute lowest; if you find a system with the same specs shipping for less, we'll beat the price. Guaranteed.

And our massive volume not only lets us offer the absolute lowest prices, but lets us deliver cutting-edge technology in every one of our systems. For example...



COMPU DYNE GIVES YOU THE LATEST TECHNOLOGY, WITHOUT THOSE INFERNAL HIGH PRICES. (BASED ON PRICES FROM 3/31/93.)



PERHAPS THIS WILL GIVE YOU A CLUE.

STATE-OF-THE-ART UPGRADABLE VESA LOCAL BUS BOARD!

- Runs any Intel 486 CPU-SX, DX, DX2... including the new super OverDrive processor based on Intel's Pentium[™] architecture.
- Latest 32 bit chipset with up to 256K write-back cache for high performance.
- VESA Local bus slot is compatible with any industry standard video, mass storage or networking card.
- Includes 2 serial, 1 parallel, and 1 game port, and support for 2 floppy & 2 IDE hard drives built into the motherboard. No switches or jumpers. It's entirely configurable through the BIOS.
- Up to 32 MBs of high speed memory.

UNPARALLELED FLEXIBILITY!



Pick a pre-configured PC or configure your own! Every Compudyne system includes:

- 1.2 and 1.44 MB floppy drives (except 486SX systems).
- 6 I/O board slots.
- 200 watt power supply.
- 101 key AT-style keyboard.
- Microsoft[®] DOS 6.0 and Windows[™] 3.1, installed and ready to run.
- Microsoft compatible serial mouse.
- U/L listing.
- FCC Class B certification.



UP OR DOWN... IT'S YOUR CHOICE.



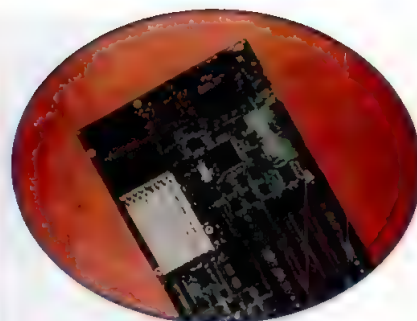
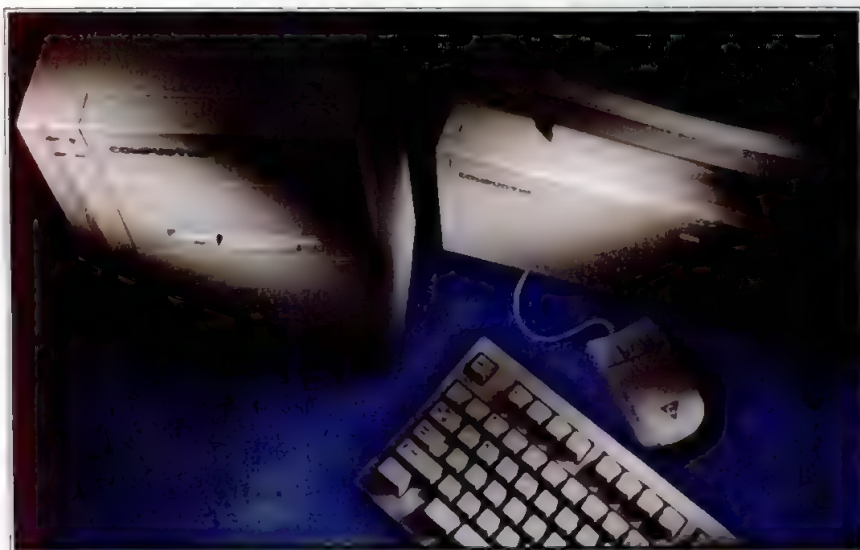
Compudyne's desktop systems feature rugged plastic-over-steel construction with 'one screw' assembly for devilishly easy upgrades. They support 3 accessible 5.25" and 2 internal 3.5" drive bays. Our mini-tower offers an incredible 6 drive capacity in a tiny 8" x 16" footprint: 4 externally accessible plus 1 internal 5.25" and 1 internal 3.5". All for a paltry \$100 more.



¹Leasing arranged through Leasing Group, Inc., payments based on 36 month open-end rate. ²Must be returned 'as new' in original packaging. ³Within the continental United States.

⁴Features one floppy drive and standard 486 motherboard; upgradable Local bus available at additional cost. Intel[®] 486 and the Intel Inside logo are trademarks of the Intel Corp.

⁵TM Trademarks belong to their registered owners.



OUR VESA LOCAL BUS BOARD MAKES UPGRADING EASY! JUST POP THE UPGRADE INTO OUR LOW INSERTION FORCE SOCKET, CHANGE SETTINGS AND GO!



* Complete Multi-Media Kit: including CD-ROM, Sound board, speakers and tons of software.

* And Much, Much More... we stock over 5000 name brand products!

MEET THE PRESS



"Our overall Best Buy is the 486SX/25 from Compudyne. It managed to balance both speed and price... it also scored well on design, and its service and support was good."

PC World, 12/92



"The Compudyne 486DX2/66 combines innovation, solid design, and low prices into a first class system."

Windows Sources, 2/93



TO order
CALL
1-800-932-C²O^MP⁷
CANADA: 1-214-702-0055
24 HR FAX: 1-214-888-5743



HOURS OF OPERATION
7am-10pm (CDT) Mon.-Fri.
9am-5pm (CDT) Sat.

486SX/25¹¹	8K CPU cache/ 4 MB	120	16 bit VGA card/ 14" 800 x 600 VGA color monitor	\$999 \$37/mo.*
486SX/33¹¹	8K CPU cache/ 4 MB	170	16 bit SVGA card/ 14" 1024 x 768 SVGA color monitor	\$1199 \$44/mo.*
486DX/33 Cache	128K CPU cache/ 4 MB	210	<i>All these systems come with:</i> 16 bit True Color SVGA 1 MB video card/ 14" 1024 x 768 SVGA 28 dot pitch non-interlaced color monitor	\$1599 \$59/mo.*
486DX2/50 Cache	128K CPU cache/ 4 MB	210		\$1799 \$67/mo.*
486DX2/66 Cache	128K CPU cache/ 4 MB	245		\$1999 \$74/mo.*
486DX/50 Cache	128K CPU cache/ 8 MB	330		\$2299 \$85/mo.*

FIENDISHLY FAST VIDEO!



Looking to fire up your video performance? Choose from our line of super-fast VESA Local Bus video cards at up to 50 MM Winmarks (v. 3.11). They turn your applications into speed demons!

CHOOSE FROM MORE FUN STUFF:



- Displays: Mono or color VGA: 1024 and 1280 interlaced or non-interlaced 14", 15", 17" and 21"
- Hard Drives: 120; 170; 210; 245; 330; 420; 535; 680 MBs or 1.2 GBs and larger
- Internal FAX/Modem: 9600 bps send/receive fax with 2400 bps Data Modem; including WinFax™ or Quicklink™ Software.

COMPUDYNE

THE LOWEST OF THE LOW PRICES. GUARANTEED.

SUPPORT

Toll-free telephone technical support.
On-site service for desktops.
Training classes available.

WARRANTIES

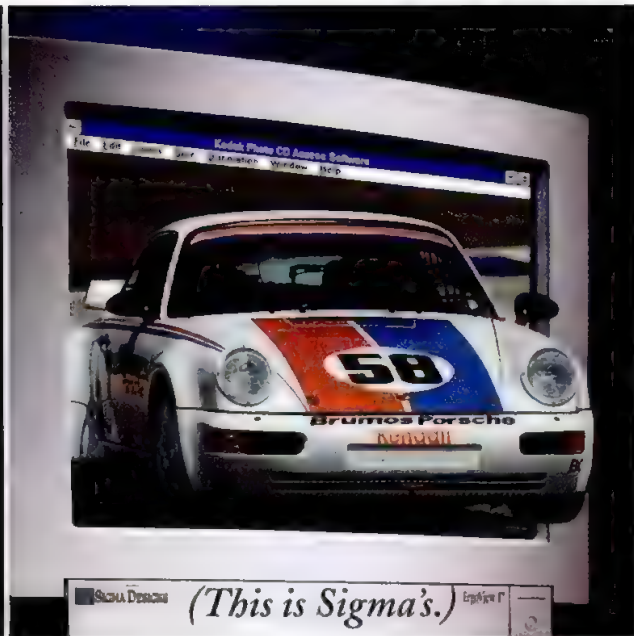
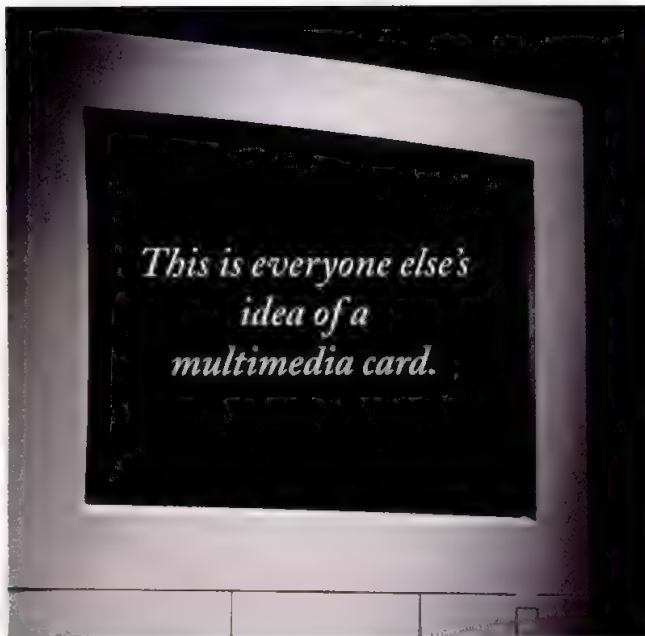
30-day, no questions asked, return policy.**
1 year limited warranty.
Extended warranty available.

PCM0631

Each system unit will be shipped from the nearest CompUSA SuperStore. Quotes: Computer Buyer's Guide & Handbook Nov. 1992, p. 95; Window Sources Feb. 1993, p. 133; PC World Dec. 1992, p. 155. Prices and specifications subject to change without notice. Compudyne Direct, 15167 Business Ave., Dallas, TX 75244.

CIRCLE 132 ON READER SERVICE CARD

© 1993 Sigma Designs Inc. The Sigma Designs logo is a registered trademark and WinStorm is a trademark of Sigma Designs, Inc. All other brand names and products are trademarks or registered trademarks of their respective holders. Vehicle used by permission of Porsche Cars North America, Inc. FOLIOSCIPE and the shape of the Porsche 911 are trademarks of Dr. Ing. h.c.f. Porsche AG.



Introducing Sigma's WinStorm. The Only Multimedia Card That Actually Is.

Introducing WinStorm™, the only display adapter that can transform your PC into an exciting, high-

performance, multimedia machine. It's a single-slot solution that lets you experience the full impact of 24-bit, photorealistic color, and 16-bit, CD-quality sound with a SCSI CD-ROM interface. Other so-called "multimedia" cards don't even offer you video capability.



WinStorm also gives you interfaces for a standard IBM® joystick, full duplex MIDI™, and a 20-voice stereo synthesizer. And its 16-bit,

**24-bit color,
16-bit sound
& CD-ROM
interface. All
in a single slot.**



stereo digital sound is fully compatible with all popular sound standards including Sound Blaster,

AdLib, Pro AudioSpectrum 16, Thunder Board and MPC. ■ So if you want your multimedia projects to really come to life,

shift your PC into a



higher gear with WinStorm. ■ For more information and the name of your nearest Sigma dealer, simply contact us directly. Telephone: 510-770-0100, Fax:

510-770-2640 **1-800-845-8086, x253**



TAKING MULTIMEDIA BY STORM™

CIRCLE 399 ON READER SERVICE CARD



Bill Machrone

Getting Organized

When the going gets tough, the tough go shopping. Things have been tough around the house lately. No, not domestic turmoil, just computer systems. Aside from the usual hassles, we've been going through the travails of trying to build

a decent local area network between the kids' and the grownups' computers. That's another story, though.

Our more immediate interest was coordinating that most suburban of concerns: our busy schedules. Between my travel, the kids' activities, and my wife's organizations and obligations, the calendar was, by turns, confusing, unreadable, and wrong. My wife, Sharon, asked me, "Can't you put this on the computer?" Normally, the correct answer is a resounding "No!" Putting simple, everyday tasks on a computer is usually a guarantee that you'll make them slower, unwieldy, and inflexible. The family calendar was so far gone, however, that anything would have been an improvement.

The market for calendar and scheduling software is not huge, especially below the level of project management and workgroup scheduling. You don't turn to Borland, Lotus, or Microsoft for this kind of thing. I suspected I would find something in the shareware market. I limbered up my 9,600-bps modem, logged onto ZiffNet, and perused the ASP (Association of Shareware Professionals) libraries. Each program has a short description, which you can read without downloading the entire file. I downloaded a bunch of candidates, then settled in for a long day of poking and prodding.

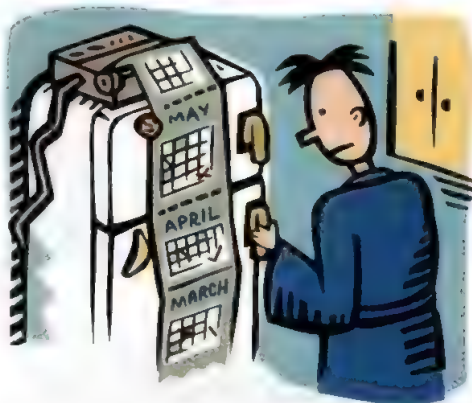
I started with the simplest, smallest program (it's an old prejudice), QuikDate. With a registration fee of only \$18, this one wouldn't damage my pocketbook too badly. But QuikDate's powerful capabilities in entering events (every Wednesday, fourth Monday, and so on) were marred by its inability to print a standard calendar. It prints only daily memos—no help when you want a single piece of paper that you can stick on the refrigerator door.

My next candidate was CalendarWise, another DOS program. With a registration price of \$29.99, it offers some nice features, including the key one for our purposes: printing monthly calendars. Its biggest weakness, however, is printing, since it uses your printer's standard fonts and depends on you to put the right codes in the printer file to choose font and font size. It comes with several preconfigured printer drivers that you can modify. The monospaced, nongraphical output was functional but less than lovely.

Next in line was Almanac, a Windows-based product with slick graphics and powerful features. Being Windows-based, Almanac had an almost unfair advantage over the DOS programs. Windows knows all the innermost secrets of your printer, comes with a variety of fonts, and gives you great flexibility.

Almanac is rich with features, including the ability to make the monthly calendar your Windows wallpaper. It uses overlays to insert holidays and other days of note. Of these, you have several choices (Jewish, Christian, USA), and you can edit them or create new ones. The monthly calendar display is limited to two lines of one entry or two single-line entries. Almanac gives you a prioritized to-do list with automatic carryover and deletion, a daily schedule that shows holidays from the overlay, items you've entered, and the ability to append notes. The event editor gives you complete control over repeating appointments, allowing you to specify days of the week or specific time intervals, such as every *n* days, *n*th day of the month, *n*th day of the week, and so on. The printout of the calendar looks downright impressive.

I loaded up some sam-



Can simple, inexpensive calendar software keep four busy Machrones on track? Now that's a torture test.

Hassle-Free Printer Sharing For Your Local Area Network

Let JetLAN turn your printer into
a stand-alone print server—in just minutes!

Simply plug JetLAN into your printer and you'll be up and running in less than five minutes. There's no need to shut down the network for installation and your Novell software is all you need.

Easiest Installation

JetLAN sets up fast because there are no mandatory file-server assignments. (In fact, JetLAN's peer-to-peer capabilities let you print even when the file server is down.) JetLAN supports up to 40 print queues on up to 16 file servers.

Increase Printing Speed Up To Five Times

Data is transferred at up to 150 K-byte/sec.



Plug JetLAN

into an HP LaserJet printer and print a typical graphic file in less than 4 seconds.

JetLAN outpaces ordinary network printing, receiving whole blocks of data at network speeds and feeding them directly to the print controller.

Network-aware Printing Power

Configure JetLAN from any supervisor workstation. Freely choose between NetWare's Pserver or RPrinter. JetLAN's diagnostic LEDs and detailed on-screen status displays always give you a commanding view of your printing operations.

Any Office Any Budget Any Printer Anywhere

Whether you're on a EtherNet, Token Ring, or NetWare ARCnet LAN—ASP has the print server solution for you. Get more productivity out of small office workgroups and big departmental LANs, dot-matrix and laser printers. Locate the printer where the people use it.



Since 1987, people have relied on ASP for reliable, hassle-free printer-sharing. We stand behind our products.

The call is free. The trial is free.

* Experience JetLAN for 30 days. No risk
No obligation. Call today for the reseller
near you or to order directly

US and Canada
800-445-6190

Dept. 63113

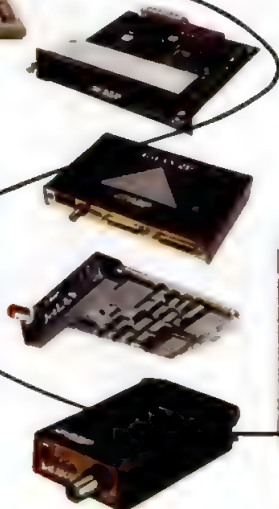
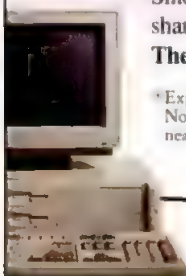
ASP

ASP COMPUTER PRODUCTS, INC.

160 San Gabriel Drive, Sunnyvale, CA 94086, USA
Phone: 408-746-2965 • Fax: 408-746-2803

European Headquarters

La Boursidière, RN 186-BP109
92357 LE PLESSIS ROBINSON CEDEX, France
Phone: 33-1-41-07-91-70 • Fax: 33-1-41-07-91-79



Bill Machrone

ple events and showed my wife the printout. Her response: "Hmm." Spousal "hmm's" can mean many different things. This was one of the good ones. At \$49, Almanac won't break the piggy bank, either.

SHOP TILL YOU DROP

Then we went shopping. We needed some supplies from Staples, and more memory for the HP LaserJet 4, and I wanted to stop by Egghead Software to check out the newest sound cards, since the one I owned had caused my Gateway 486 DX2/66 to roll over and play dead. Passing the Windows software display, I happened to see PowerUp's Calendar Creator Plus for Windows. According to the blurbs on the box, the software seemed to do everything we wanted and then some. The "and then some" was more than I could have hoped for, because Calendar Creator Plus comes with a library of clip art and a nice management tool, the Power Album. Earlier in the day, Sharon had asked if we had any clip art suitable for the elementary school newsletter she was working on. At the Egghead price of \$57, this struck me as a flat-out bargain. (Okay, I probably could have done even better by mail order, but sometimes you have to be impulsive.)

When we got home, I installed Calendar Creator Plus and fired it up. What a treat! It was as if they had taken the best features from all the other programs and added a few of their own. Entering events is blissfully simple, and you can assign them to specific days by dragging your mouse across them. A QuickDate dialog box gets you to any date in a hurry, and aids data entry. Calendar Creator maximizes its use of Windows by giving you item-by-item control over font, size, and style. The clip art sizes itself to the boxes, the text wraps around the art, text strings and titles are fully customizable, and the resulting printout is gorgeous. You can use the numerous standard styles, or create your own by modifying the abundant settings. You can print on standard organizer filler paper or create your own personal pocket calendars, called InstaBooks. I could go on, but you get the idea. This is a feature-rich product.

Given all the things this program can do, my mind is already percolating with applications. A calendar program may not change our lives, but at least our chaotic existence will be well documented. □

AMAX 486DX2/50 ISAmx Power Station



PC
MAGAZINE
EDITORS'
CHOICE

February 23, 1993
Amax 486DX2/50 ISAmx

"...Olympic-class performance scores on PC Magazine Labs' benchmark tests, spacious expansion possibilities, and excellent components, the AMAX 486DX2/50 deserves a gold medal."

AMAX

#1

Out of 61 Tested
by PC Magazine

30%+ FASTER WINDOWS with LOCAL BUS

32 BIT VIDEO PERFORMANCE

Winmark speeds from 18.5 to over 28 million. Complete line of video cards installed; Diamond, ATI, Orchid, STB, Actix, Impression.

Local Bus Power Station Configuration

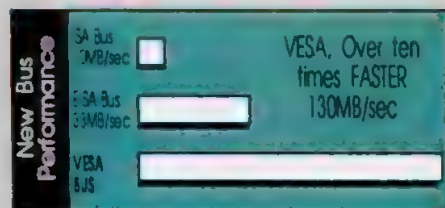
4MB RAM, Exp. to 32MB
Impression 786 Motherboard
128K External Cache
Windows Accelerator VLB VGA
Mini Station Case
UL/CSA Power Supply
2 Serial, 1 Parallel
VL-BUS IDE Interface
Conner 251MB Hard Drive
1.44 & 1.2 Teac Drive
15"-1280 x 1024 Monitor
Honeywell 101 Keyboard
Microsoft Windows & DOS

CIRCLE 194 ON READER SERVICE CARD

UPGRADABLE CPU PERFORMANCE

The Impression 786 Motherboard allows you to upgrade the system performance as simply as changing the CPU. Compatible with 386DX to 486DX2/66MHz processors.

AMAX's VL-BUS PERFORMANCE



**486DX 33MHz
VESA Local Bus**

\$1995

**486DX2 50MHz
VESA Local Bus**

\$2149

**486DX2 66MHz
VESA Local Bus**

\$2295



AMAX

Engineering Corporation

3288 Laurelview Court
Fremont, CA 94538
FAX 510-651-3720

Call Today
800-800-6328
Ext. 68



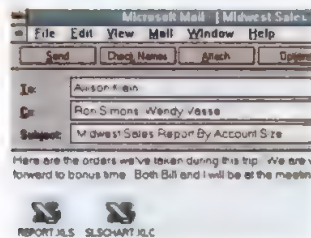
Corporate & Dealer/VAR Inquiries Welcome



All other products are trademarks of their respective holders. Prices and specifications are subject to change without notice. The Intel Inside Logo is a trademark of Intel Corporation.



**YOU WOULDN'T BELIEVE WHAT
GOES ON IN SOME OF THESE PLACES.
INTRODUCING MICROSOFT MAIL
REMOTE FOR WINDOWS.**



**Now your e-mail
works the same
no matter where
you open it.**





Now you can do things inside a motel you've never been able to do. That is if you have Microsoft® Mail 3.2 in the office. And new Mail Remote for Windows™ on the road.

You can send or receive anything in your messages – pictures, charts, graphs, sound, spreadsheets, even entire files. Just like you do when you're in the office.

And to make your long distance phone calls a little shorter, you can preview your messages and download only the ones you want.

You won't spend much time training either. In fact, if you're familiar with Microsoft Mail, you already know how to use Remote.

If not, call us at (800) 642-7676, Department KH8, for more infor-

mation. We'll also send you a copy of the article where *PC Magazine* gave Microsoft Mail their Editors' Choice Award.

No matter where you are, once you have Remote for Windows, room service doesn't get any better.

Microsoft
Making it easier

ZEOS® 486DX2-66. Only \$2995!

Compare.
For Under \$3000
Nobody Else
Gives You All This.



BUY WITH CONFIDENCE.
ZEOS is PC Magazine U.S. Readers' Choice for Service and Reliability! ZEOS is the only PC vendor to receive the "Excellent" rating for both desktop and laptop systems.



16MB RAM, 452MB HDD!

Intel 486 66MHz CPU
ZIF (Zero Insertion Force) upgrade socket with Pentium™ OverDrive™ support

- 16MB of RAM, expandable to 64MB on the motherboard
- 452MB high-speed 12ms IDE hard drive with 256K cache
- Local bus IDE hard drive interface
- 1.2MB and 1.44MB Teac floppy drives
- ZEOS 14" high-resolution 1024x768 non-interlaced SVGA color monitor, .28mm dot pitch
- 1MB high-speed Diamond VESA local bus card with Windows accelerator
- Eight expansion slots, including two VESA local bus
- Socket for optional on-board SCSI
- Two serial ports, one parallel port
- Shadow RAM/EMS support
- Flash BIOS
- High-capacity 200W power supply with built-in surge suppression
- ZEOS SpaceSaver case with seven drive bays
- Two cooling fans
- ZEOS 101-key tactile/click keyboard
- Microsoft DOS, Windows and Mouse plus Lotus Organizer
- Choice of Lotus Improv, 1-2-3, Ami Pro or Freelance for Windows
- Entire system UL listed—not just the power supply
- FCC Class B approved
- 24-Hour-A-Day, 365-Day-A-Year Toll-Free Technical Support
- 30-Day Money-Back Guarantee
- One Year Limited Warranty

"... look at ZEOS's new 486DX2-66... That's value pricing."

—Jim Seymour,
PC Magazine, Feb. 9, 1993

"An array of features to make a user's mouth water."

—PC Magazine,
January 26, 1993

"Kudos for its excellent motherboard design, great performance, and thoughtful little extras... These features set the ZEOS apart from the crowd."

—PC/Computing,
March 1993,
BEST VALUE

"... blew all competitors away—in some cases performing more than ten times as fast as competitors."

—PC Magazine,
January 26, 1993,
on the ZEOS
486DX2-66 with
optional Viper
video card

AND FOR ONLY \$995 MORE, GET YOUR ULTIMATE POWER MACHINE!

All of the above features plus:

- 128K memory cache
- Diamond Viper video card with 1MB RAM
- 1.0GB SCSI hard drive upgrade
- On-board SCSI controller
- Vertical case
- 300 watt power supply

ONLY \$3990!

**CALL NOW TOLL FREE
800-554-7172**

Fax Orders: 612-633-1325, Government: 800-245-2449, TDD Orders: 800-228-5389, Outside U.S. and Canada: 612-633-6131. MasterCard, VISA, Am Exp, Discover, Z-Card™, COD and Leasing programs. Open 24 Hours a Day, 365 Days a Year!



Purchase orders from Fortune 1000 companies, governments and institutions subject to approval. Leasing programs available. All prices and specifications are subject to change without notice. Please call to confirm pricing, specifications and warranty details. All products and company names are trademarks or registered trademarks of their respective holders. © 1993 ZEOS International, Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS). DX266-PCM-9306A

CIRCLE 125 ON READER SERVICE CARD



John C. Dvorak

BIOS, BIOS, Who's Got the BIOS?

It's this BIOS thing that keeps bugging me. As I see the dead end of the PC architecture approaching, either something must be done or we will move on to the Power PC, the Digital Alpha, or some MIPS machine. First I chided the industry

about it, then Microsoft, then Intel. It was last night when I woke up in a cold sweat after reading (in my dream) an incredible ad.

Maybe this is getting tiresome, but let me recap the problem. The BIOS, which controls the I/O of the PC, dates back to 1983 and limits the machine to a minimum configuration of serial and parallel ports. It will only talk to a few disk drives and has no clue about SCSI or anything new. This means incompatible or flaky device drivers have to be user-installed to make these new peripherals work, and they only barely work, if at all. SCSI is a particular nightmare for some users.

So here's my dream. It starts with this ad:

From IBM: Upgrade on a Chip

The new IBM SuperBIOS chip turns an obsolete computer into a full-featured screamer! Have the fastest, hottest, best-performing machine in your town!

• *Fast ROM technology: It's no longer necessary to load BIOS into RAM for increased performance*

• *Full SCSI I & SCSI II support at the BIOS level: Finally, you can attach any SCSI device (optical, Syquest, scanners, etc.) in a daisy chain just like you can with the Mac*

• *New IDE support, including the latest CD-ROM support*

• *Unlimited number of disk drives can be used by computer*

• *Support for EISA, ISA, VL-Bus, and Micro Channel*

• *Support for both ASCII and Unicode at the BIOS level*

• *Optimized for OS/2 and other GUI environments: Includes OS/2 microkernel in ROM! Doesn't interfere with Windows support*

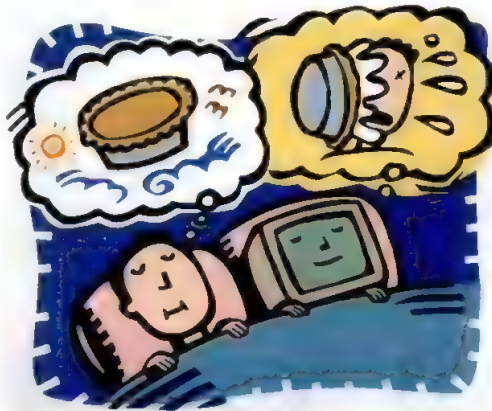
• *Fully backward-compatible with AMI, Award, and other commonly used BIOS code*

- *Full BIOS support for COM3-COM10*
- *Full BIOS support for LPT3-LPT10*
- *New enhanced high-speed parallel port support*
- *Full 16-bit support for digital sound*
- *Ethernet I/O support for on-board Ethernet: Use it just as you would any other port!*
- *Other features and enhanced capabilities too numerous to mention*
- *Easy dealer installation*
- *Suggested retail price: \$69.95*

Find out if your machine can use the SuperBIOS by calling IBM at 1-800-555-4IBM, or ask for the IBM performance upgrade at better stores everywhere. Now available factory-installed on most quality 486 and Pentium computers. Ask for it by name: the IBM SuperBIOS. Only from IBM.

In the dream I was somehow transformed into a reporter asking for comments on the potential of this new chip. One guy from a research firm said, "IBM is back to its old tricks, trying to make everything proprietary." An ex-IBMer working for a Korean clone company said, "It's too cheap, and IBM will drop it in a month." A third fellow said, "IBM is wasting its time, and besides that, the Power PC will do all these things better."

That's when I woke up and realized my dream of a new BIOS—despite the potential market—may be a pipe dream foiled by the industry's historical neglect of its installed base. Why should things change? When the Power PC (or whatever new platform) arrives, the owners of the old machines will be left in the dust just as the owners of CP/Ms and Apple IIs were left in the dust. Still, the SuperBIOS is a great idea.



I had a weird dream about IBM's upgrade on a chip. It was called SuperBIOS, and it was hot!



Kodak
Diconix
180si printer

*The KODAK DICONIX 180si Printer, from the innovator in portable printers relied upon by over one-half million PC users, now carries a three-year warranty.**

Which means the proven performer now carries even more value than ever.



Because you'll find our three-pound DOS-compatible printer comes equipped with everything you expect in a portable.

The silent reliability of ink jet technology. An impressive array of feed options, including tractor, single sheet, and transparency. And a nationwide network of authorized service agents.

All in a footprint smaller than a sheet of paper. And at a new suggested list price of a mere \$349 (U.S.) for the complete package. (Dealer prices may vary.)

For more information about the portable printer that has proven itself time and again, and the name of the dealer nearest you in the U.S. or Canada, call 1 800 344-0006.

The KODAK DICONIX 180si Printer. The portable with a proven past. And a secured future.

* If purchased and used in the U.S.A., Canada, or Puerto Rico, this printer, with its adapter, is warranted by Eastman Kodak Company, to the original purchaser, to be free from defects in materials and workmanship for three (3) years from the date of original purchase. Kodak makes no other warranties, expressed or implied, including implied warranties of merchantability and fitness for purpose.

THE PORTABLE WITH A PROVEN PAST NOW COMES WITH A SECURED FUTURE.

KODAK DICONIX 180si Printer



John C. Dvorak

Inside Track

Is **Windows NT** part of a **grand scheme** to derail the competition? That's the conclusion I've drawn after a few **rumors** and a couple of facts passed across my desk.

The first rumor was that **IBM plans to build its own Pentium** and a line of optimized x86 chips using that old license from Intel it obtained when it was part-owner of Intel. An industry insider said to me, "IBM has finally figured out that Intel and Microsoft are its enemies." Microsoft, maybe—but Intel? Hmmm. I then remembered how over the years **Microsoft has been closely involved with Intel**. Bill Gates once bragged about how Microsoft nearly designed the 286 for Intel. The companies are very tight, but this hasn't been publicized much recently.

The next thing across my desk was *The Microprocessor Report*, which said the **Pentium** is just catching up with the **R4000**, a two-year-old design from Mips.

Then came a report of NT's rumored **poor performance**. A guy with the latest beta alleges that the following statements are true: 1. Microsoft recommends a 25-MHz 386 processor, 12MB of memory, and at least 75MB of disk space just to get NT up and running! The system files alone take 50MB of disk space. 2. Performance of NT Beta2 stinks: DOS under NT is 5 to 25 percent slower than DOS under Windows 3.1, and Windows under NT is 20 to 30 percent slower than Windows 3.1. 3. Windows 3.1 apps are **non-preemptively scheduled** with respect to each other (you get cooperative multitasking only, just as in Windows 3.1). 4. When NT runs on RISC systems, it goes through a 286 emulator, and that means you get **Standard mode only** (no Enhanced mode Windows applications will run). 5. There's *no* support for Remote IPL (i.e., *no* diskless workstation support). 6. MS-DOS graphics applications *must* run **full-screen** on the x86 platform. 7. 16-bit Windows 3.1 drivers are not supported.

None of this surprised me except running NT on a **RISC via 286 emulation** since I was under the impression that NT was going to be ported to RISC, not run through an emulator—yuk! Then again, this may **all be bogus**, and NT is actually the **perfect operating system** that all the magazines say it is, sight-unseen. It just seems like a long time coming.

This "long time coming" thought was in my mind as I read about the **Digital Alpha chip coming out in a 200-MHz** version. Where the heck is the 150-

I've been wondering...

Does Microsoft really want Windows NT to succeed? Is NT real, or is it just a smoke screen to advance Microsoft's marketing goals?

Conspiracy theorists, get to work!

MHz version? By the time Digital starts shipping this Alpha machine in quantity, it'll be the turn of the century. **What's the delay?** Well, Digital is banking on NT, and so are the MIPS people.

The icing on the conspiracy cake came when Microsoft said it was working on **Windows 4.0 and DOS 7**—both 32-bit standalone operating systems. Windows 4.0? Why bother, if NT is this killer diller be-all and end-all OS?

Finally the **light bulb** lit!

Does Microsoft really want NT to succeed? Is NT real? Or is it just a smoke screen OS to accomplish two marketing goals: 1. To keep Microsoft's buddy, Intel, in the driver's seat (until Intel can catch up to RISC designs) by **forestall-**

ing the RISC makers with promises of a crossover OS. Why should Microsoft want to fragment the market by supporting Digital Alpha and the MIPS RISC line? That would mean it would have to port products to unknown, complex platforms. If nothing else, it would be easier to support, say, Excel running on Intel-only platforms than Excel running on a half-dozen different RISC machines with oddball displays and I/O. The cost of porting and support would eat into profits. It would make no sense for Microsoft to risk its dominance by encouraging market fragmentation. But if NT were just a red herring, then it would make sense.

2. **To forestall OS/2 gaining market share** on Windows. NT serves the useful purpose of becoming the carrot in front of the donkey until Windows 4.0 comes along. Most Windows users expect that NT will be the next great operating system because Microsoft told them it would be. And, gee, it looks great on paper! And most beta-testers say it works fine, too. But why are we hearing talk about Win 4.0? All the talk about future products does a wonderful job of keeping the Windows users (and developers) in line.

There are a lot of different ways this can go. Remember how quickly Microsoft **pulled the plug** on its version of OS/2 with denials up to the last moment. Is it possible that Microsoft would do the same with NT? There's plenty of good technology in NT that can be incorporated into Windows 4.0 and targeted to Intel-only platforms. The vast majority of users won't care about NT if Win 4.0 is feature-laden and fast.

I'm sure that a few incomplete versions of NT will be released. One version should be out as you read this. There were a couple of OS/2 versions by Microsoft, too. Have you noticed how companies find a **formula for success** and then keep repeating it? □

Finely-Tuned Orchestrated Solutions...

It takes more than just great computers to meet the information management needs of today's businesses. It takes talented people who have the ability to orchestrate solutions using the finest products and services available. And that's precisely what you get when you choose Northgate.

Here are just a few examples of the hardware platforms that await you. Keep in mind that we'll configure your systems any way you like. And back them with service and support that was just named "Readers' Choice" by *PC Magazine*. Take a look, then call Northgate today.



Northgate® ZXPortable™

- 80486SX/25MHz or DX/25MHz processor
- 120MB hard drive (200MB available)
- 4MB RAM (expands to 16MB)
- VGA monochrome with 64 shades of gray or Active Matrix Color display with 256 simultaneous colors
- 86-key full-travel keyboard
- Nickel metal-hydride battery for up to 4 hours of power (3 hours color)
- 8.5" x 11" size
- Monochrome weighs 6.2 lbs.; color 6.4 lbs.
- MS-DOS 6.0 and Windows™ 3.1
- Logitech™ TrackMan Portable mouse
- Fabric carrying case
- Free \$395 value PackRat PIM/contact management software

ZXPortable 486SX/25
Monochrome **\$1899** Color **\$3599**

ZXPortable 486DX/25
Monochrome **\$2099** Color **\$3799**

Optional Docking Station \$599

Docking Station Bundle with 14" SVGA color monitor, OmniKey keyboard, 1.2MB floppy drive and desktop mouse \$999



Northgate 486-VL

- 80486SX/25 processor
- Upgradable to OverDrive™ processors
- Two bus-master VESA local bus slots
- Local bus video with 1MB RAM
- 128K cache
- 4MB RAM (expands to 64MB)
- 100MB hard drive
- Space-saving case (tower available)
- 1.2MB or 1.44MB floppy drive
- Northgate 15" non-interlaced SVGA color monitor
- 101-S keyboard

\$1749 (Lease as low as \$62.86/mo.)*

As configured above with 80486DX/33 processor **\$1999**
(Lease as low as \$73.96/mo.)*

As configured above with 80486DX/66 processor **\$2449**
(Lease as low as \$90.61/mo.)*



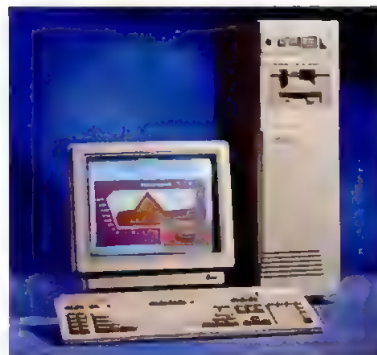
SlimLine® 486 ZXP-L

- 80486SX/25 processor
- Upgradable to i486™ processors and OverDrives
- 1MB local bus video
- Virtual cache
- 4MB RAM (expands to 128MB)
- 100MB hard drive
- Space-saving SlimLine case
- 1.2MB or 1.44MB floppy drive
- Northgate 14" non-interlaced SVGA color monitor
- 101-S keyboard

\$1499 (Lease as low as \$55.46/mo.)*

Configured as shown with 80486DX/33 processor **\$1749** (Lease as low as \$62.79/mo.)*

Configured as shown with 80486DX/66 processor **\$2199**
(Lease as low as \$81.36/mo.)*



Elegance 486 ZXP EISA VESA

- 80486DX/33 processor
- Upgradable to other i486 processors and OverDrives
- Eight 32-bit expansion slots
- 128K cache (256K available)
- 8MB RAM (expands to 256MB)
- 240MB IDE hard drive
- Space-saving case
- 1.2MB or 1.44MB floppy drive
- Accelerated™ Windows video with 1MB RAM
- Northgate 15" non-interlaced SVGA color monitor
- 101-S keyboard

\$2999 (Lease as low as \$102.57/mo.)*

As configured above with 80486DX/50 processor **\$3349** (Lease as low as \$114.54/mo.)*

As configured above with 80486DX/66 processor **\$3449**
(Lease as low as \$117.96/mo.)*

Elegance 486 ZXP

- 80486SX/25 processor
- Upgradable to i486 processors and OverDrives
- 64K cache
- 4MB RAM (expands to 32MB)
- 100MB hard drive
- Space-saving case (tower available)
- 1.2MB or 1.44MB floppy drive
- Northgate 14" non-interlaced SVGA color monitor
- 101-S keyboard

\$1599 (Lease as low as \$59.16/mo.)*

As configured above with 80486DX/33 processor **\$1849**
(Lease as low as \$66.38/mo.)*

As configured above with 80486DX/66 processor and Tower case **\$2299** (Lease as low as \$85.06/mo.)*

At Prices That Will Make You Applaud.



Northgate OmniLAN Systems

Northgate offers a variety of "plug and play" network solutions for up to hundreds of users. Here is just *one* example.

Novell® Server

- Elegance™ ZXP 486DX/50 EISA
- 16MB RAM
- Adaptec 1740 SCSI controller
- 525MB hard drive
- 1.44MB floppy drive
- Intel Ethernet Express 32-bit Thinnet interface card
- VGA video adapter
- 14" VGA monochrome monitor
- 101-S keyboard
- FREE installation of Novell NetWare with NetWare purchase

\$4649 (Lease as low as \$154.35/mo.)*

Power Workstation

- SlimLine ZXP 486SX/25
- 4MB RAM
- 240MB hard drive
- 1.44MB and 1.2MB floppy drives
- Local bus VGA with 1MB RAM
- Intel Ethernet Express 16-bit Thinnet card
- 14" SVGA color monitor
- 101-S keyboard

\$1749 (Lease as low as \$62.79/mo.)*

Advanced Application Workstation

- Elegance ZXP 486DX/66
- 8MB RAM
- 240MB IDE hard drive
- 1.44MB and 1.2MB floppy drives
- Accelerated Windows video with 1MB RAM
- Intel Ethernet Express 16-bit Thinnet card
- 14" SVGA color monitor
- 101-S keyboard

\$2999 (Lease as low as \$102.57/mo.)*

Northgate Server Array

- 486DX2/66 EISA motherboard with 16MB RAM (expands to 128MB)
- Single SCSI channel; expandable to 3 and 5 channels
- EISA bus master with 33MB burst mode transfers
- 4MB cache controller; expands to 64MB
- 560MB base storage; expands to 10GB
- RAID levels 0, 1 and 5
- Hot-sparing and background data rebuild for zero downtime
- Three independent power supplies with redundancy
- 14" SVGA monochrome monitor
- Northgate 101-S keyboard
- Novell certified device drivers and utilities for NetWare™ 3.11
- Vertical case
- Five year limited warranty

\$8699 (Lease as low as \$280.98/mo.)*

Northgate External Disk Array

- 560MB base storage; 60GB maximum with 5 channel array
- Single SCSI channel; expandable to 3 and 5 channels
- EISA bus master with 33MB burst mode transfers
- 4MB cache controller; expands to 64MB
- RAID levels 0, 1 and 5
- i960-based RAID controller and cabling to connect the array to the server
- Hot-sparing and background data rebuild for zero downtime
- Three independent power supplies
- Novell certified device drivers and utilities for NetWare™ 3.11
- Vertical case
- Five year limited warranty

\$4599 (Lease as low as \$152.69/mo.)*



Award-Winning

Northgate OmniKey™ Keyboards

- Choose 101NI with 12 F-keys on top; 102 with 12 F-keys on left or ULTRA with 12 F-keys on top and left
- Alps™ click/tactile key switches
- Independent inverted "T" cursor control and numeric keypads
- Limited dexterity features
- Rate select from 3-120 CPS
- Interchangeable CTRL, ALT, CAPS LOCK keys
- OmniKey utility disk
- Unmatched IBM® compatibility
- FCC Class B certified



OmniKey/101NI or 102

ONLY \$89

OmniKey/ULTRA-T

ONLY \$129

Call For More Information
800-453-0129

GSA #GS00K91AGS5193 PS01

Major credit cards, money orders, direct wire and approved company purchase orders accepted.

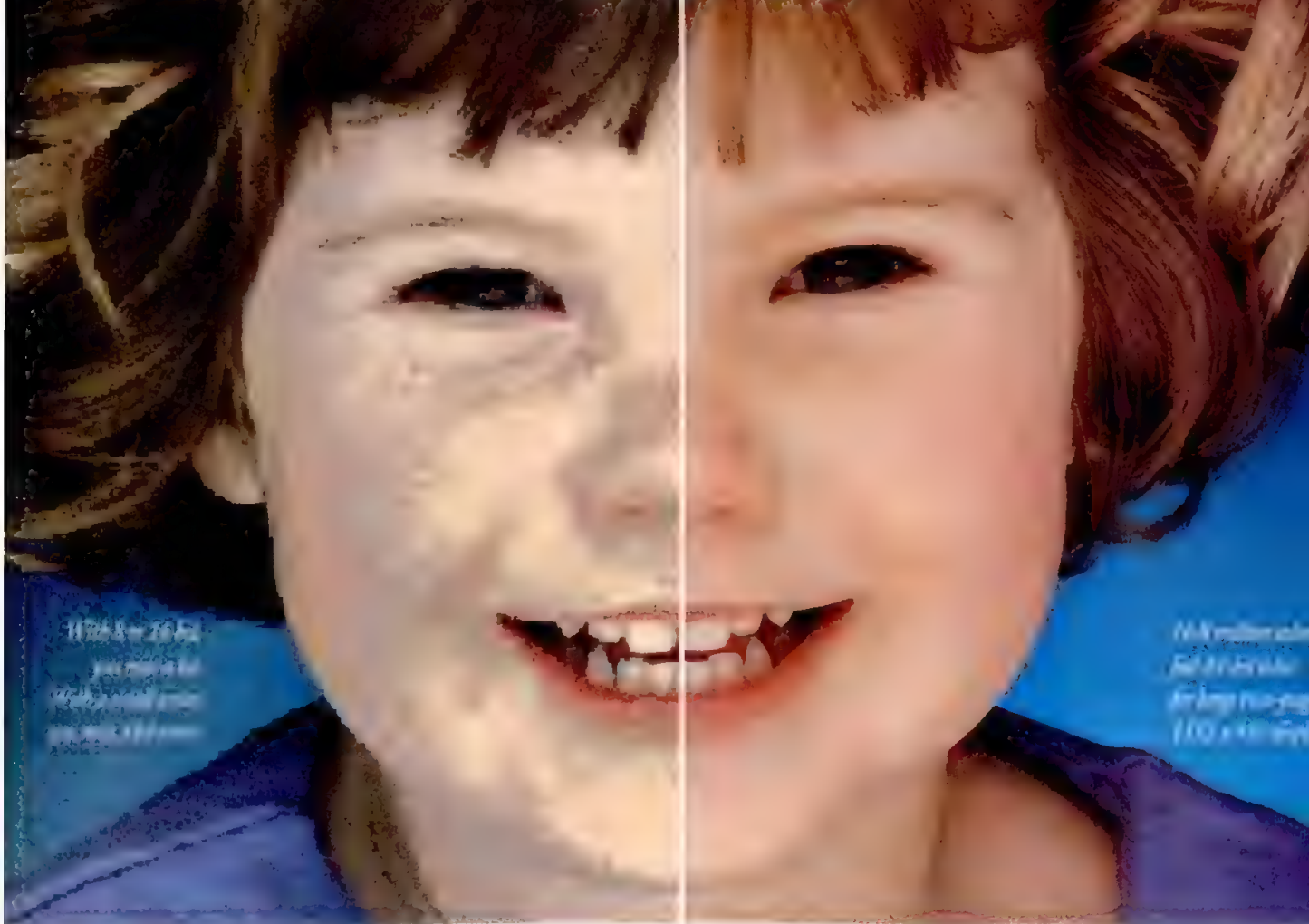


NORTHGATE

Solutions for Workgroups™

7075 Flying Cloud Drive, Eden Prairie, MN 55344

PERFECT SKIN. \$999.



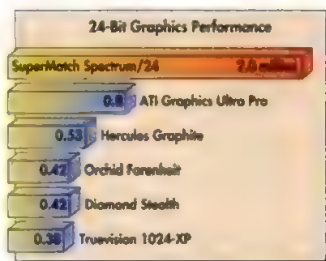
SPECTRUM/24 FOR WINDOWS. THE BEST 24-BIT PRICE/PERFORMANCE FOR LARGE-SCREEN DISPLAYS.

Only Spectrum/24™ gives you 16.8 million colors at resolutions up to 1152 x 910. That's two full pages in full color. And for only \$999. It delivers a fast 75 Hz non-interlaced display for flicker-free graphics.

Now you can afford to see all your Windows™-based desktop publishing, presentation

Note: Tests based on the PhotoStones™ 24-bit graphics benchmark performed by Jon Peddie Associates on a 33 MHz 80486-based EISA system. All units are in millions of pixels/second.

FASTER IS BETTER



graphics, and imaging applications like never before. Big and brilliant. So, if you've been looking for the best price/performance for a perfect picture, stop looking.

BIGGER IS BETTER

Spectrum/24:
1152 x 910

Matrox &
Number 9:
1024 x 768

ATI Ultra Pro:
800 x 600

Diamond
Stealth &
Hercules
Graphite:
640 x 480



It's right in front of you.

For your nearest Authorized Reseller, call **800-334-3005**.

For information via fax, call SuperFacts™ 800-541-7688.

SUPERMATCH
by SuperMac Technology

**SEE US AT
WINDOWS WORLD,
BOOTH M6529**

Available for: ISA, EISA, and VL-Bus. card utilizes true-color graphics silicon, 5 custom ASICs, and 3 MB high-speed VRAM. Includes drivers for Windows version 3.1 or later. Display support for 14"-21" multimode displays provides 16.8 million colors at 1152 x 910, 1152 x 870, 1024 x 768, 800 x 600, 640 x 480, with easy-to-use resolution-switching function. Display compatibility with SuperMatch™ 20-T True-Color Display, NEC models 3D, 4D, 5D, 3FGX, 4FG, 5FG, and equivalent displays, and standard VGA-, SVGA-, and VESA-compatible displays, FCC Class B approved. Five-year warranty.

©1993 SuperMac Technology, Inc. All rights reserved. SuperMac, SuperMac Technology, Spectrum/24, and SuperMatch are trademarks and SuperFacts is a service mark of SuperMac Technology, Inc. Windows is a trademark of Microsoft Corporation.

CIRCLE 127 ON READER SERVICE CARD



Jim Seymour

PC Sound: Eight Isn't Enough

I've spent the past six to eight months immersed in the arcana of PC multimedia. Animation on a PC screen is intriguing, whizzy slide shows are impressive, and interactive multimedia is going to be extremely important. Those are the immediately

impressive technologies, the facets of multimedia most seductive for writers and PC users alike.

But underlying these attention-getting techniques is a simpler but equally vital medium: sound. And despite huge advances in PC sound, too many users still think of sound as little more than the *whooshes*, *clanks*, and phony laser *pinngggs* behind computer games.

The huge, quick success of the Creative Labs Sound Blaster card contributed to that reputation. Game makers started paying a lot more attention to the audio in their packages, to the point that producing the "sound track" for a new PC game these days has become as complex as creating a hit on the pop charts—or harder, since the result must be packed into a very tiny block of digital-sound code.

But there is life after Sound Blaster, and there are worlds of useful applications for PC sound beyond computer games.

I've talked often about my affection for what Compaq and Microsoft call "business audio." That's basically the lowest level of interactive PC audio: You can record and play back sound on your PC. Business audio is enormously useful for such things as adding voice annotation to documents and spreadsheets, and I use it often.

It's relatively easy to choose the right hardware and software tools for business audio. The Microsoft Windows Sound System is very good, and Logitech's AudioMan parallel-port system is great, especially for slotless notebook-PC users. There are a few other good options, such as Orchid technology's Fahrenheit VA-series video cards, which add voice-annotation support to their primary video-display function.

The problems come when you begin to reach beyond simple voice annotation, which requires little more than 8-bit hardware, a microphone, and inexpensive speakers. Dealing with the puzzling world of more-capable 16-bit audio cards, mono versus stereo, and speakers and amplifiers up to the standard of 16-bit PC audio can be frustrating. Expensive, too, if you buy less flexibility and performance than you need, and have to trade up too soon.

Let me share four rules of thumb, gleaned over 20 years of producing and showing conventional multimedia presentations with their associated sound tracks, and several months of immersion in PC multimedia issues.

Eight Isn't Enough. Simple 8-bit PC sound systems are fine for audio annotations, or for playing back what I would call functional audio from CD-ROMs—instructions for using a new program, for example. And relatively primitive 8-bit sound is perfectly sufficient for some special purposes, such as learning a language, as with the little sound dongle in the wonderful Power Japanese software package.

But for anything more professional, you want 16-bit sound—often called CD-level sound, because at its best it approximates the sound quality of audio CDs. New 16-bit cards, such as the Sound Blaster 16 ASP or the Media Vision Pro AudioSpectrum 16, are capable of vastly better sound than the first- and second-generation 8-bit cards.

Mono Isn't Enough. Most low-level PC sound work, such as voice annotation, is in mono and works fine. But beyond those simpler uses of PC sound, you want stereo. Even if there isn't much stereo sound in the originals you're dealing with



A great multimedia presentation deserves great stereo sound. Get the best system you can afford.

The world's best printer sharing value. PrintDirector.

PC Magazine has called PrintDirector a "device we can unreservedly recommend to direct the printer sharing needs of almost any user."

And for good reason. PrintDirector offers world-class peripheral sharing products for every budget and work group. Including PrintDirector Bronze, the most affordable printer sharing device. And PrintDirector Gold Turbo, the world's fastest. (Plus PrintDirector Silver, the world's next fastest.) Test results prove it.

NATIONAL SOFTWARE TESTING LABORATORIES' SPEED TEST RESULTS*							
Harvard Graphics Output File (Seconds to Print)	PrintDirector Gold Turbo	PrintDirector Silver	Novell Lite	ASP	ESI	Buffalo	Lantastic
	42.8	59.6	203.9	183.1	84.9	84.6	71.1

PrintDirector Gold Turbo printed nearly five times faster than Novell Lite, almost 2 1/2 times faster than ASP Port Authority, about twice as fast as ESI Share Spool and Buffalo SLMkII, and 40% faster than Lantastic.

*Based on printing an output file created with Harvard Graphics. Total time for three PCs to print concurrently to two printers.

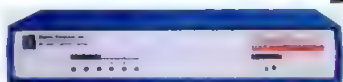
ANATOMY OF A GREAT DEAL

PrintDirector has won more times than any other device.



Comes with the industry's best support — and it's **FREE!**

Easiest device to install, according to NSTL.



Prices start at \$395 for PrintDirector Bronze.

30-day unlimited money-back guarantee.

Reliably used by over one million users worldwide.



Saves you more time when printing.

To find out more about the world's best printer sharing value, call and we'll send you a free NSTL report and our catalog.

1-800-243-2333

or 617-647-1234

FREE

Printer Sharing Device Performance

An NSTL Report



DIGITAL PRODUCTS, INC.

the leader in networked printing and peripheral sharing

411 Waverley Oaks Road, Waltham, MA 02154

PrintDirector is a registered trademark of Digital Products, Inc. All other trademarks mentioned are property of their respective holders.

Jim Seymour

today, there will be tomorrow. Then you'll regret going for an old, mono-only setup.

Use a Realistic Sampling Rate. When you're recording sound, choose a sampling rate that's suitable for your CPU, and that strikes a balance between sound quality and file size. Sample rates available on PC sound systems typically range from around 12 kHz (telephone-line sound) up to 44.1 kHz (equal to audio CDs).

I've found that you can use up to 32-kHz sampling rates without problems on any 386SX or better platform, and with most faster 286s. Any PC using a 486 chip can handle the higher-quality 44.1-kHz rate.

Just because your PC can handle higher sampling rates doesn't mean you need to use them. Voice recording is fine at 8 kHz and better. And even music recordings sound very good at 32 kHz. I save 44.1 kHz only for really critical music mastering.

Why? Because file size increases rapidly as your sampling rate increases. Don't chew up valuable hard disk space in order to get sound quality you don't need.

Buy Good Speakers. I'll be discussing in detail the subject of speaker selection in the future, but simply put, you should get good speakers, and make sure you have enough amplification.

The speakers sold with many multimedia PCs are miserable. The best that can be said is that they cost the PC vendor so little that it's not too painful to throw them away.

You'll almost certainly need amplified speakers. Sound cards' audio output is just too feeble to drive respectable speakers, even with a card that boasts a "powerful, 4-watt amplifier!" The Altec-Lansing ACS300 PC-sound speaker system, at about \$300, including a compact, separate sub-woofer unit, is very good. So are Acoustic Research's AR 570s, Bose Roommates and a few other units in that price range.

If you have a small stereo system in the room in which you use your PC, consider running your PC sound card's audio output into the stereo's AUX, CD, or TV jacks, or any other unused high-level inputs. You'll have plenty of amplification, and much better speakers than those connected to most users' PCs.

PC audio can be dazzlingly good. Almost any presentation—even a simple PowerPoint or Freelance slide show—benefits enormously from an appropriate sound track. □

**IN TODAY'S CROWDED MARKET,
HOW DO YOU CHOOSE A PC?**



DON'T JUST CHOOSE A COMPUTER,

Brand Name Quality, High Customer Satisfaction Scores And Industry-Leading Service — All For The Price Of A Clone.

Winning at the computer game means getting the right computers for the job AND the service and technical support to keep them up and running. At CompuAdd, we make that game easy.

How easy? Well, compare our prices to the lowest in the industry. Now, compare our services to the most expensive brand names. See what we mean?

At CompuAdd, you get the best of both worlds. Great prices and some of the industry's most advanced services — like 24-hour toll-free technical support, network and installation assistance, and a first-time-user hot line. We also give you the luxury of custom configurations and a limited two-year warranty.

We call this unique package of award-winning services, The CompuAdd-Vantage. Service like this is the advantage of having CompuAdd standing behind you.

Intel, Cyrix Or IBM? — At CompuAdd We Have All Three. (Who Says You Can't Please Everybody?)

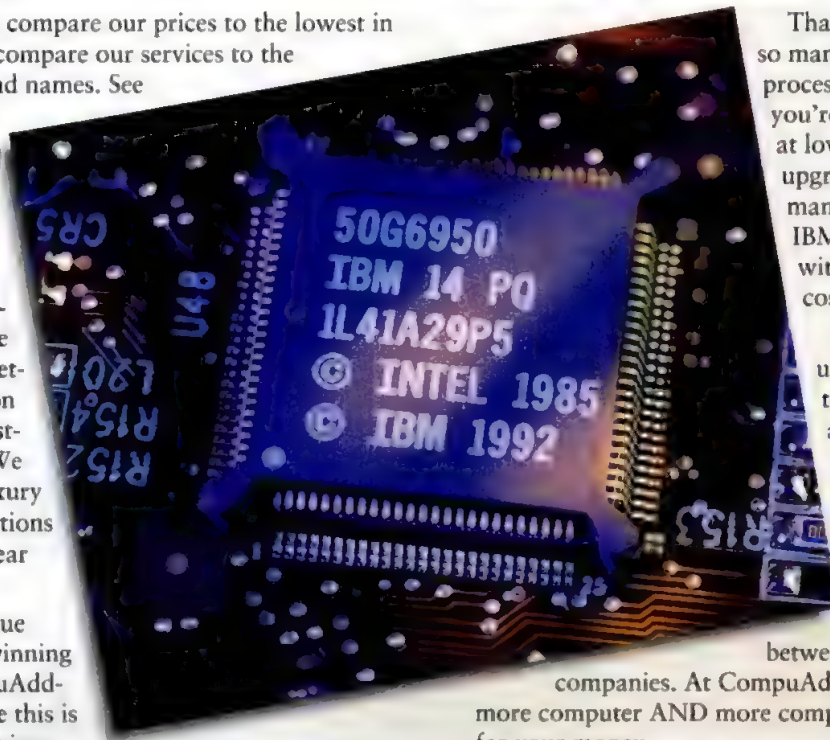
You're looking for the computer that's right for the job. Sometimes that means inexpensive, sometimes that means a computer that can expand if your needs do. And sometimes that involves meeting specific benchmarks.

That's why CompuAdd uses so many different kinds of processors. Cyrix is sexy if you're looking for 486 power at low prices. Intel is swell for upgradeable high-performance computers. And the IBM™ shown here keeps up with 433DX processors that cost a lot more.

So at CompuAdd, we use all three. Because listening to our customers and giving them what they need is what we do best.

In the end, picking the computer that's right for the job comes down to choosing

between computer companies. At CompuAdd we give you more computer AND more computer company for your money.



OUR COMPETITORS CAN'T TOUCH OUR NEW PRICES! CALL 1-800-289-9888.

LOW PROFILE SYSTEM

COMPUADD 450SLC-2

4MB DRAM
170MB hard drive, Dual FDD
.28 14" non-interlaced monitor
Windows accelerator
DOS/Windows
FREE! Novell Netware Lite® 1.1
On-site service

\$1695

DESKTOP POWER SYSTEM

COMPUADD 466DX-2

Upgradeable ISA motherboard
8MB DRAM, 256K cache
340MB hard drive, Dual FDD
15" non-interlaced monitor @ 72 Hz
CompuAdd Viper local bus video card
DOS/Windows
FREE! Novell Netware Lite® 1.1
On-site service

\$2995

TOWER SYSTEM

COMPUADD 466EDX2

8MB, 256K cache
500MB SCSI hard drive, Dual FDD
Adaptec 1740 SCSI host adapter
14" non-interlaced monitor
Windows accelerator
DOS/Windows
FREE! Novell Netware Lite® 1.1
On-site service

\$3795

SPARC STATION

COMPUADD SS 2

28.5 MIPS, 40MHz RISC-based processor
16MB DRAM, expandable to 64MB
525MB SCSI hard drive
17" multisync color monitor
Sunsoft's Solaris 1.01 and OpenWindows preloaded
Network ready
On-site service

\$5995

CompuAdd
CUSTOMER DRIVEN, BY DESIGN.

Key Code 816

CHOOSE A COMPUTER COMPANY.



THE COMPUADVANTAGE

LOW PROFILE SYSTEMS

COMPUADD 433

4MB DRAM, 128K cache
170MB hard drive
.28 14" non-interlaced monitor
Windows accelerator/local bus
Dual FDD
DOS/Windows
FREE! Novell Netware Lite® 1.1
On site service

\$1895

LOW PROFILE SYSTEMS

COMPUADD 433SLC

4MB DRAM
80MB hard drive
.28 CVGA monitor
Windows accelerator
Dual FDD
DOS/Windows
FREE! Novell Netware Lite® 1.1

\$1295

DESKTOP POWER SYSTEMS

COMPUADD 466DX2

Upgradeable EISA motherboard
8MB DRAM, 256K cache
340MB hard drive
15" non-interlaced monitor @ 72 Hz
CompuAdd Viper local bus video card
Dual FDD
DOS/Windows
FREE! Novell Netware Lite® 1.1
On-site service

\$3195

*Consistently High Scores In
Customer Satisfaction Surveys.*

*First with Cutting Edge
Engineering, Flexible Services
And Unique Solutions.*

*Proven Reliability — Over 10 Years
In The Computer Business.*

INNOVATIVE

CompuAdd Leads The Industry
In Bringing You Technical Excellence.

*First to offer built-in trackballs
in all our notebooks.*

*First to bring you more choices in
processors from IBM™, Cyrix™ or Intel™.*

*First on the market with the Viper,
the industry's fastest video controller.*

RESPONSIVE

At CompuAdd, We're Proud To Give
Customers What They Ask For.

*Leading the industry in customized systems,
special services including pre-installed
software and extensive factory burn-in.*

*First with 4-hour on-site service,
disaster recovery assistance,
and the unprecedented technical support
available in our MC SERIES.*

DESKTOP POWER SYSTEMS

COMPUADD 433

8MB DRAM, 64K cache
170MB hard drive
15" non-interlaced monitor @ 72Hz
ATI Ultra Pro Graphics Card
with 1MB VRAM
Dual FDD
DOS/Windows
FREE! Novell Netware Lite® 1.1
On-site Service

\$2595

TOWER SYSTEM

COMPUADD 433 TOWER

8MB, 64K cache
170MB SCSI hard drive
14" non-interlaced monitor
Windows accelerator
Dual FDD
DOS/Windows
FREE! Novell Netware Lite® 1.1
On-site service

\$2545

NOTEBOOK

COMPUADD 325TX

2MB DRAM expandable to 8MB
60MB hard drive
10" diagonal display with 64-level grayscale
Built-in trackball
Built-in fax/modem capability
3.5" 1.44MB floppy drive
11.3" x 8.5" x 1.5"
Preloaded with DOS and Windows
Sleep key and power management
1 parallel port, 1 serial port
AC adapter
80387 math coprocessor socket

\$1295

With 80MB hard drive \$1495

1-800-289-9888

TO ORDER OR FOR A CORPORATE CATALOG, CALL 800-289-9888
FROM OUTSIDE THE U.S. CALL 512-258-5575

CompuAdd
CUSTOMER DRIVEN, BY DESIGN.

ASK FOR A DEDICATED REPRESENTATIVE FOR EDUCATIONAL, FEDERAL,
STATE AND LOCAL GOVERNMENT, FORTUNE 1000 AND NATIONAL ACCOUNTS

© 1993 CompuAdd Computer Corporation.
Prices and product description numbers are subject to change without notice.

CompuAdd is not liable for damage due to omissions or typographical errors.
Call 1-800-666-1872 for a copy of CompuAdd's complete warranty.

Key Code 816

CIRCLE 126 ON READER SERVICE CARD



Bill Howard

Laptop Buyers' Checklist

Businesses that buy portable computers in quantity have lots of buying experience now—experience of the sort a child gains by grabbing a boiling pot. In the past, buyers have been burned by settling for almost-good-enough portables. As

users trade in desktops for portables, they are less willing to buy compromised machines.

What are the must-have features for notebooks? My list is based on four assumptions: First, the world is going to Windows. Second, Windows is a performance pig. Third, monochrome graphics just doesn't cut it for Windows. Fourth, add-ons (pointing devices, high-speed modems) should be built-in. Here's the checklist:

- **486 CPU.** Clock tick for clock tick, a 486-class CPU delivers twice the performance of a 386, but the cost of a 486 system is only \$250 more. Don't scrimp unless you know you won't use Windows at any point during the life of your system—between now and, say, 1996.

- **Built-in pointing device.** Let's be blunt: All built-in pointing devices are pretty terrible, but they're always there for you. When you're on the road or in transit you'll use the built-in pointer, but when you're back in the office, plug in a real mouse. Sorry, but clamp-on trackballs, such as the Microsoft BallPoint Mouse and Logitech's TrackMan Portable, are too clumsy, and Microsoft's QuickPort, the no-cable version of BallPoint, is too little, too late. (Note: Preference in built-in pointing devices is very personal. That said, I believe more users prefer the IBM Trackpoint II, a mini-joystick between the G and H keys, and the Apple PowerBook, a front-mounted trackball.)

- **PCMCIA slots (plural).** For all their faults (and there are many), those credit card-size PCMCIA sockets are going to be the way to add modems, memory, flash memory, LAN cards, wireless communicators, and small-capacity removable hard disks. Get a system with two sockets unless you want to remove your modem every time you hook up your network

card. Look for the larger sockets, particularly Type III (10-mm height) and the unrated Type IV (17-mm height). Why? Some devices won't be compact enough to fit in a Type II slot for two or three years.

- **Color display.** A mediocre color display is better than a good monochrome one, but I suspect companies will split their purchases between the two. Users who have notebooks as primary machines and who run Windows a lot will get color systems. Those who run Windows occasionally will get monochrome notebooks: They'll save \$500 to \$1,500 and a pound of weight, and they'll gain up to an hour of battery life and a thinner display.

- **200MB hard disk.** You probably wouldn't settle for 120MB on the desktop. Heat-seeking users should watch for the 340MB systems coming soon. That's right: 340 megabytes from a two-platter, 2.5-inch disk drive. Ain't technology grand?

- **Docking station.** A docking station will free you from fumbling to make half a dozen connections each time you return to your office. It can hold a fast video card and an inexpensive network card, and can be a security cradle. If all you need are the cable connections, look

for a port replicator. If you plan to stay loyal to one vendor, get a commitment to compatibility with future models.

Those are the must-haves—as distinct from the nice-to-haves, such as eight (not four) cursor control keys, upgradable screens, and removable floppy or hard disks. What if you don't want all these features and all this functionality? Be thankful for those who do: They'll drive down prices of less desirable systems living below the technology curve. That's why you can buy a 6-pound 386 notebook for \$999 today. □



Your next notebook should have a 486 CPU, a built-in pointing device, PCMCIA slots, and a color display.

Read my

PC
MAGAZINE

EDITORS' CHOICE

Couple its outstanding overall performance with a true optical resolution of 400 dots per inch, an excellent scanning software package (*DeskScan II*), and HP's well-earned reputation for solid, reliable products, and you have a winning combination.

It's blazing

THE BEST
HARDWARE
& SOFTWARE
OF THE YEAR.

PC Magazine Labs' difference between the every test. In line with the **HP ScanJet IIc**, seconds, while five 115 seconds or more.

In general, you're twice as long for a color scale. With a fast scanner, translate into a half hour, the set up to color more.

...top scoring product...

Publish

'92

READERS' CHOICE
AWARD

SUPERIOR PERFORMANCE

The ScanJet IIc performed well during all phases of PC Magazine Labs' testing. In terms of speed, this scanner led the field, ranking first in two of five speed trials and best overall. Some scanners,

as a whole, and a street price as low as \$1,450, and it's hard to imagine a better buy.

An excellent choice for any PC desktop

clips.

fast!

scanner excellence), only one—Hewlett Packard's ScanJet IIC excelled in both categories.

PC
MAGAZINE
EDITORS'
CHOICE

April 14, 1992
HP ScanJet IIC

g showed considerable dif-
est and slowest machines on
de at 300 dpi, for instance,
nned our text page in 22
ts competitors required
complete the same task.
a expect to wait roughly
graphics scale as for gray-
r, this difference might
ute or so. With a slow scan-
ay cost you 2 minutes or

as made scanning as simple as possible.

GRAPHICS

COLOR FLATBED SCANNERS

out Hewlett-Packard Co. has come
far to make the ScanJet IIC an
enticing buy, no matter what the
application.

Past HP scanners have

PC Computing 92
MVP
WINNER



HP ScanJet IIC



HP ScanJet IIP

We'd hate to brag. So we'll let the PC press do it for us.

Both *PC Magazine* and *Publish* called the HP ScanJet IIC the *Best Color Scanner* for 1992. While *PC Computing* named the black & white/gray-scale HP ScanJet IIP the *Most Valuable Product* of the year.

Speed. Simplicity. And accuracy were all applauded. It's no wonder. HP's single-pass scanning delivers both lightning-fast speed and precise color registration. TWAIN support allows scanning without having to switch between applications. And HP AccuPage technology with 400-dpi resolution can tackle the toughest OCR challenges. What's more, capabilities this advanced are now even more affordable. List price on the HP ScanJet IIC has just dropped to \$1,599. The HP ScanJet IIP is just \$879.

Impressed? Don't just take our word for it, or even the PC press's. Attend one of our scanning seminars that will be held April through September, 1993. To find out more about the HP ScanJet IIC and IIP or seminars in your area, call 1-800-SCANJET, Ext. 7365*. And judge for yourself.



**HEWLETT
PACKARD**

**"It's a quality desktop replacement...
most powerful portable we've seen."
One of the lightest units in the entire test group."**

- PC Magazine, Mar. '93

**"...in our battery tests, the TI 4000 WinDX2/50
achieved a magnificent 6 hours and 24 minutes."**

- Portable Computing, Apr./May '93

**"TI has done more to customize and optimize
Windows than the other notebook vendors."**

- Windows Magazine, Feb. '93



TravelMate, WinDX and "Extending Your Reach With Innovation" are trademarks of Texas Instruments.
The Intel Inside logo is a trademark of Intel Corporation. © 1993 TI.

**TI TravelMate 4000
WinDX2/50**

**OUR
PERFORMANCE
IS GETTING
RAVE REVIEWS.**

As well it should.

For starters, the TravelMate™ 4000 WinDX2™/50 notebook computer comes with a 486 DX2 50MHz processor for increased speed and performance.

It's specifically designed around built-in Windows, so it's able to power up in just 30 seconds.

And its amazingly long battery life is made possible by TI's superior power management system.

For more information about the incredible, lightweight, award-winning TravelMate 4000 notebooks, simply call 1-800-527-3500.

TravelMate 4000

486 WinDX2/50	486 WinDX2/40 COLOR
4 or 8MB RAM std. (20MB max.)	8MB RAM std. (20MB max.)
120 or 200MB HDD	200MB HDD
5.6 pounds	6.3 pounds

Battery life varies according to model and use



**EXTENDING YOUR REACH
WITH INNOVATION™**

**TEXAS
INSTRUMENTS**

CIRCLE 304 ON READER SERVICE CARD

The New PCs

BY MICHAEL J. MILLER

Say good-bye to the PC as we have known it. Good-bye to DOS. Good-bye to a world of only Intel-compatible CPUs. Good-bye to the architecture IBM introduced in 1981.

We are destined for a future that includes portable, 32-bit, multitasking operating systems running on incredibly fast, RISC-influenced, superscalar CPUs. In this issue, we take a look at the building blocks of the PCs of the future, from alternative hardware platforms to emerging operating systems.

New platforms will compete with the dominant 486 architecture and Intel's new Pentium processor. The Apple Macintosh Quadra 800, Digital Equipment Corp.'s Alpha AXP PC, Hewlett-Packard Co.'s Precision Architecture (PA)/RISC chip, the IBM RS/6000 PowerStation 365 (the predecessor to the PowerOpen architecture IBM is developing with Apple and others), and

the Sun SPARCstation LX bring new levels of performance and new capabilities in PC-style boxes at PC-style prices.

Microsoft's DOS just got a major update, but many users are looking beyond DOS to 32-bit multitasking alternatives. Unix has been around for a long time, but it's getting brand-new respect on the Intel platform with products such as NeXTStep, SCO's Open Desktop, Sun's Solaris, and Univel's UnixWare. Other advanced operating systems are coming too, and we take a long look at the upcoming Windows NT and the release of OS/2, Version 2.1. All of these promise new capabilities while preserving compatibility with existing standards. Will they succeed? Only time will tell. But welcome to a world where Microsoft and Intel are no longer the only players in town. Welcome to the world of the new PC.



WORKSTATION PLATFORMS • Heavyweight Contenders

PC Magazine sends a Pentium-based Compaq workstation into the ring to do battle with five industrial-strength workstations from Apple, Hewlett-Packard, IBM, Silicon Graphics, and Sun.

by Don Crabb

A year ago, we set out to compare the hottest PC we could find (at the time, an Intel 486/50 EISA-based machine; we used a Dell PowerLine 450DE) against three hot desktop workstations—a NeXTstation Turbo Color, a Sun SPARCstation 2GX, and an Apple Macintosh Quadra 700. Our conclusions: Despite the sheer computing prowess of the workstations, we preferred to stick with our PCs because they enabled us to do more of our business computing faster (and because of the variety of applications that were available on DOS/ Windows PCs, as well as our familiarity with the platform).

A year later, we've decided to run this comparison again, but to up the ante. Last year's Dell has given way to an even hotter PC—a Compaq Deskpro 5/66M Model 510 with the new Intel Pentium CPU. We tested the Deskpro 5/66M with DOS and



ght



a version of Unix (so we could compare its performance versus Unix workstations). Last year's Quadra 700 has been replaced by the faster Quadra 800. The SPARCstation 2GX has been superseded by the less expensive, more mainstream SPARCstation LX, which includes GX graphics acceleration for its targeted PC users. The NeXT is no longer with us. After the company quit the hardware business in February, we dropped the 33-MHz 68040 Turbo Color machine from our tests.

In order to make up for this loss, we set our sights on a new pack of desktop workstations, all sporting hot RISC CPUs and running some variant of Unix. The new test subjects included the Hewlett-Packard HP Apollo 9000 Model 715/50, an IBM RS/6000 PowerStation 365, and a Silicon Graphics Iris Indigo R4000 XZ.

WHY DO YOU BUY A COMPUTER?

There is a tendency among the computing faithful to believe that their computers are the best around. Regardless of whether you're a lover of PCs, Macintoshes, or workstations, you probably tend to extend reality a little bit when it comes to seriously evaluating your true

love. In this article, we have attempted very hard to push aside our PC bias (after all, this is *PC Magazine*), as well as our Macintosh and workstation biases. In short, we have tried to answer a very simple question—Which computer should you

buy?—by testing each of these machines with real-world and laboratory tasks.

The simple truth is that you don't really buy computers (or you shouldn't), you buy computing solutions. By that we mean you buy software that will do the tasks you want done in as efficient a man-

ner as possible. The computer only becomes important after you have picked the software you like best (because it fits your needs, the way you work, and your budget). The computer, in that scenario, is nothing more than the device that can run the software.

The problem, of course, is that not all computers can run all software. Thanks to the proliferation of competing operating systems, we find ourselves confronted with a mountain of software that runs only on specific machines, running specific operating systems with specific hardware configurations. So our hope of buying computing solutions (software) as though the platform didn't matter has been stymied.

Instead, when we buy applications, we have to be extra careful that the version we like is the one that will run on our machine. Even software that purports to be cross-platform-compatible can only be identical to the degree that the underlying operating system (and graphical user interface) allow.

In order to take these types of software differences into account during our

IN THIS REVIEW

Apple Macintosh Quadra 800.....	138
Compaq Deskpro 5/66M Model 510.....	136
HP Apollo 9000 Model 715/50.....	146
IBM RS/6000 PowerStation 365.....	152
Silicon Graphics Iris Indigo R4000 XZ.....	157
Sun SPARCstation LX.....	160
Performance Tests.....	132
Comparing CPU Architectures.....	144

HIGHLIGHTS

PC Platforms

BOUNDARIES are blurring among the Apple Macintosh, Intel-based desktop PCs, and Unix workstations using RISC-based CPUs. The traditional PC can now run robust operating systems, and traditional workstations can use operating systems that run mainstream business applications.

WINDOWS NT runs on the PC and on some RISC workstations, meaning users seeking a powerful successor to DOS and Microsoft Windows have a wider choice of CPU platforms. Speedy RISC workstations have adopted graphical interfaces that hide the underpinnings of Unix.

IN THIS ARTICLE, we test the Pentium-based Compaq Deskpro 5/66M Model 510, the Apple Macintosh Quadra 800, the HP Apollo 9000 Model 715/50, the IBM RS/6000 PowerStation 365, the

Silicon Graphics Iris Indigo R4000 XZ, and the Sun SPARCstation LX. We also discuss Digital's Alpha AXP PC and the IBM-Apple PowerPC.

EDITORS' CHOICE wasn't awarded because so much depends on your intended application. We did rate the six systems on their suitability to task for six environments: application development, connectivity, engineering, DTP, 3-D graphics, and general office productivity.

IN TESTS under Unix, the Pentium chip performed roughly on a par with midrange RISC systems on integer tests. On floating-point tasks, however, the RISC systems were on the order of twice as fast. The Unix RISC workstations will also stand out for networked application development and for SQL databases.

AMONG THE RISC workstations that we tested, the HP, IBM, and SGI machines each showed particular strengths. The SPARCstation LX lagged (even behind the Compaq machine), but it isn't Sun's most powerful unit. With the Pentium, the PC now has a CPU that holds its own.

THE MACINTOSH user interface is the best of the bunch. But the Mac is out of its league when it comes to performance. On some graphics tests, the PC was an order of magnitude faster.

PRICES RANGED from \$7,500 (Compaq) to more than \$30,000 (Silicon Graphics). The level of equipment clearly affected its price and performance. The Compaq was the overall price-performance leader, while the HP (\$17,240) offered the most bang for the buck among RISC PCs.

evaluations, we attempted to test cross-platform applications (to give us some sense of how the "same" application fared on different platforms) as well as platform-specific applications that take special advantage of the hardware and operating systems of the test machines (to show any special advantages particular platforms might have for accomplishing certain computing tasks).

WELCOME TO OPEN SYSTEMS

Today we see a desktop-computing world dominated by PC/DOS machines. We also see another strong desktop world controlled by the Apple Macintosh. In addition, we have an odd desktop workstation market with its reliance on Unix, an operating system we've been told is "difficult."

A potent threat to Intel's dominance of the PC-processor market is coming from several RISC-processor vendors.

What if we were to tell you that, within a year, all of this was going to change? The truth is that the convergence of operating systems and RISC-based CPUs is shaking the foundations of the traditional desktop computing world. By the middle of 1994, we will have affordable, extremely powerful desktop computers that are capable of running multiple operating systems (some in native mode and others in emulation), and thus are capable of running different GUIs and almost every desktop application you can buy.

The players in the operating system convergence game include Microsoft with Windows NT, its first unified OS/GUI version of Windows; various vendors' versions of Unix that are based on the AT&T and Open Software Foundation (OSF) System V, Release 4 (SVR4), standard; IBM's OS/2; and the Apple-IBM-Motorola PowerOpen system.

Each of the competing operating systems will offer full 32-bit data path compatibility with their CPUs (which im-

Suitability to Task

All of our Suitability to Task ratings are based on comparisons of the relative merits of all the units we reviewed.

The HP Apollo 9000 Model 715/50 did well in every category, receiving top scores as an applications development machine and engineering workstation. Its X11 library graphics accelerator was by far the fastest in the group. The IBM RS/6000 PowerStation 365 also ranked highly. But bear in mind that the PowerStation 365, in its tested configuration, cost \$6,195 more than HP's offering. The PowerStation 365 fell short only in office productivity: the availability of office productivity software was more restricted than in the case of the HP Apollo 9000.

The Apple Macintosh Quadra 800 suffered in comparison with the more robust systems in this review. We judged it outstanding in only one category: desktop publishing. And it was only the Mac's wealth of innovative DTP software and the widespread acceptance of its output formats that drove that score up.

The Pentium processor in the Compaq Deskpro 5/66M Model 510, on the other hand, signals the arrival of the Intel x86 family. The Pentium, with its excellent floating-point performance and enhanced internal processor caches, gave the PC the power to compete in domains previously reserved for midrange workstations.

The Silicon Graphics Iris Indigo R4000 XZ was easily the most popular machine at PC Magazine Labs during its stay. Demonstrations of ElectroGIG USA's 3D Go were breathtaking: the ease with which three-dimensional objects can be manipulated in real time is a testimonial to the unit's graphics subsystem.

Applications development scores are based on the availability of a wide variety of compilers and debuggers, ease of coding for the platforms' supported operating systems, and raw compile speeds under FORTRAN and C, as measured by Workstation Labs (WSL).

Connectivity scores are based on the ease of communications in homogeneous and heterogeneous

proves overall performance), preemptive multitasking (which enables you to run multiple applications intelligently), protected memory (which prevents one misbehaving application from causing the entire system to crash), and built-in scalable networking.

A potent threat to Intel's dominance

SUITABILITY TO TASK				
Product Name	POOR	FAIR	GOOD	EXCELLENT
Applications development	●	○	○	○
Connectivity	●	●	○	○
Engineering/scientific/2-D CAD	●	●	●	○
Desktop publishing	●	●	●	●
3-D graphics	●	●	●	●
Office productivity	●	●	●	●

environments, the ease of communications in a DOS networked environment, the ability to read and write DOS files directly, and the ability to run DOS (emulation) sessions.

Engineering/scientific/2-D CAD scores are based on each system's performance on low-level floating-point tests (SPECfp92, Stanford Floating-Point, and Whetstone tests), graphics tests, and CAD tests (San Diego AutoCAD Users Group tests), as well as other tests that were administered by Workstation Labs.

Desktop publishing (DTP) scores are based on the availability of a variety of DTP software and output options, graphics performance, application performance (for the Quadra 800 and Deskpro 5/66M only), and overall system performance.

3-D graphics (animation and modeling) involves some of the most demanding tasks a system can perform. Graphics acceleration, floating-point performance, multiprocessing capacity, and overall system performance were all factored into the ratings for this category.

Office productivity is a catch-all category involving some of the more common tasks that might occur in an office environment, such as word processing, spreadsheet analysis, creation of business presentations and forms, data entry, e-mail correspondence, and scheduling. Highly rated platforms support a variety of applications within each category and ideally allow smooth integration of all of the various tasks.

of the PC-processor market is coming from several RISC-processor vendors, including Digital Equipment Corp. and its 200-MHz Alpha chip, on which Windows NT will run (for more information, see the sidebar "Preview: Alpha AXP PC"). Apple, IBM, and Motorola will be putting forward their multiple OS desk-

THE KITCHEN SINK IS

If you're getting the feeling the T4500 series represents a new standard in business notebook computing, you're right.

Our T4500C features an LCD TFT active matrix color screen that can display a kaleidoscope of 256 simultaneous colors from a palette of 185,193. Our T4500 offers a large, bright, easy-to-read 9.5" VGA display with 640 x 480 resolution and 17:1 contrast ratio.

A 150-pin expansion port lets you attach a SCSI adapter to the notebook. Or lets you attach the notebook to our Desk Station IV, providing true desktop capabilities in your office.

System control hotkeys save time by allowing you to quickly change your display setting, power management, security status, etc., without having to call up menus.

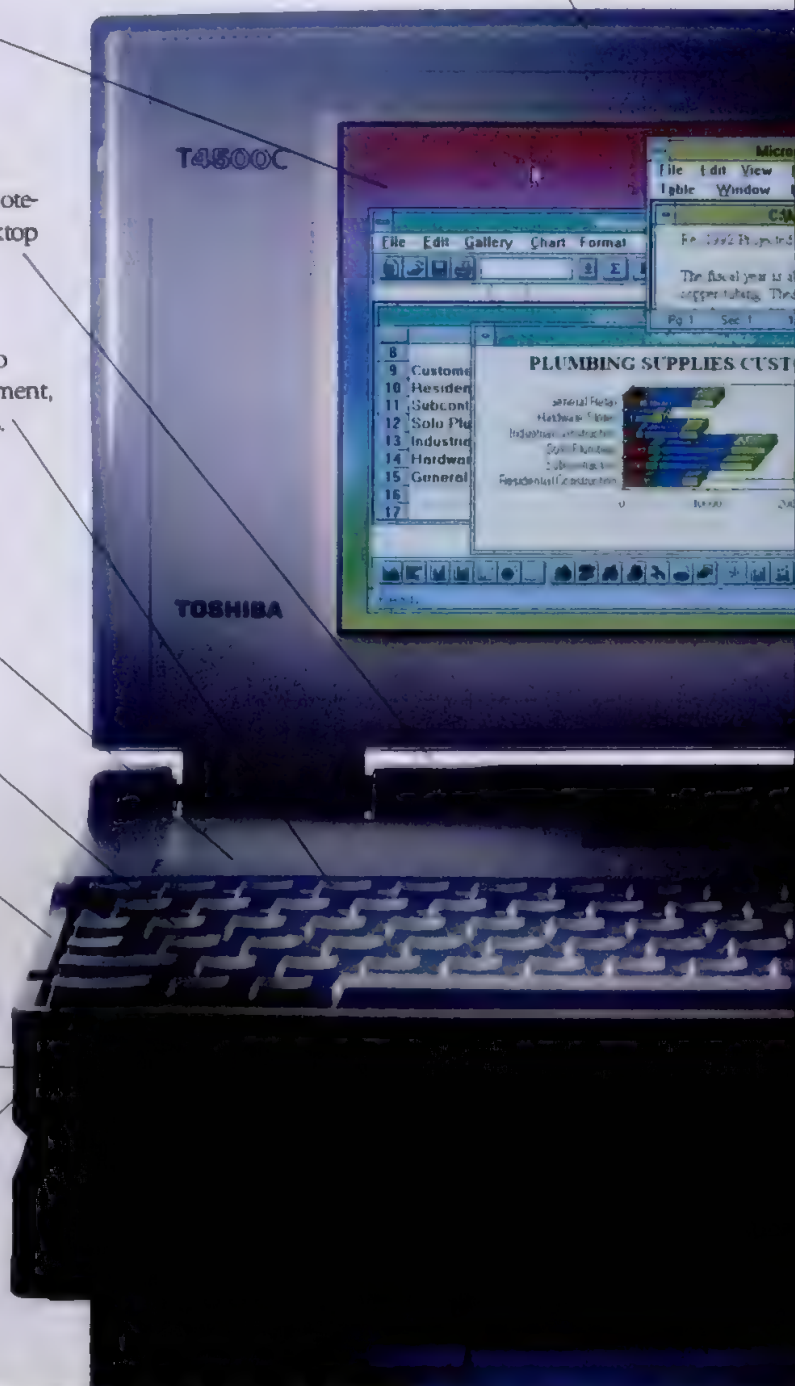
A generous 4MB RAM standard, expandable to 20MB.

Our award-winning keyboard features standard-sized keys and key spacing.

The T4500 series' advanced 20MHz i486™ SX processor makes any 386 seem like a tortoise. In fact, tests reveal it's up to two and a half times faster than many 386-based notebooks.

The T4500C comes with a 120MB hard drive and our T4500 comes with a choice of an 80MB or 120MB hard drive.

3.3-volt chip technology decreases power drain by as much as 25%, while adding up to 27% more battery life.



INTRODUCING THE

OPTIONAL.

The T4500C's dimensions: 11.7"W x 8.3"D x 2.0"H.
The T4500's dimensions: 11.7"W x 8.3"D x 1.8"H.
Both fit into half of a briefcase.

Windows® 3.1 and DOS® 5.0 with Ultrafont™ come pre-installed.

AutoResume lets you start where you left off without rebooting and automatically saves your material when you turn the power off.

Our Quick Charge capabilities allow you to charge the battery while you're working.

Featuring AutoResume, AutoSave, Advanced Power Management, and CPU Sleep Mode, our MaxTime™ power management system helps you get the maximum out of every battery charge.

Quickread LCD status icons allow you to check a host of functions (including remaining battery time, keyboard status, and power-saving mode) at a glance.



An industry-standard PCMCIA 2.0 slot accepts removable hard drives, data/fax modems, network adapters, and other expansion options.

The BallPoint™ mouse connects directly to the computer through a unique "one touch" QuickPort, so there's no cord to get in your way.

A front-loading floppy drive provides easy access.

Both the T4500 and the T4500C weigh in at about 6.5 lbs.



The T4500 features a large, easy-to-read 9.5" monochrome screen.



Tests reveal that the 3.3-volt 20MHz i486™ SX processor is up to two and a half times faster than many 386-based notebooks.



You can call real-live Toshiba technicians toll-free for complete product support.



In Touch with Tomorrow
TOSHIBA
1-800-457-7777

TOSHIBA T4500 SERIES

manufacturers

CIRCLE 379 ON READER SERVICE CARD

top solutions based on the PowerPC chip. Sun Microsystems (using its next-generation SPARC 3 CPUs) and Hewlett-Packard (using a slimmed-down version of PA/RISC) also are in the race. Several other vendors (including Acer and startup DeskStation Technology) are fielding systems based on MIPS R4000 and R4400 RISC chips that also will run Windows NT. Confusing, you say? Let's try to sort out all the information.

WHAT'S IN AN OS, ANYWAY?

Operating systems are obviously the control programs of modern desktop computers. To run applications, you must have an operating system that controls the hardware, provides a file system, and provides a unified interface for general computing housekeeping duties such as file copying, renaming, and deleting.

DOS-based PCs use a version of the venerable (and quite simplistic) Microsoft Disk Operating System (DOS), typically with the Windows GUI layered on top. Windows NT will eliminate the need for the antiquated DOS underpinnings by providing a true 32-bit operating system that ties to the hardware directly and includes its own file system and the Windows GUI. For our application tests on the Compaq Deskpro 5/66M, we chose the most recent version of DOS (Version 5.0) running Microsoft Windows 3.1.

Workstation Labs, an independent testing facility well known in the Unix world, conducted the bulk of the testing for this review (Workstation Labs, 4324 North Beltline, Suite C-211, Irving, TX 75038; 214-570-7100). When Workstation Labs tested the Pentium-based Deskpro 5/66M against the RISC workstations, it did so by running a version of Unix from The Santa Cruz Operation (SCO), called SCO Unix 3.2, Version 4.0, running Open Desktop 2.0.0.

Each of the midrange workstations we tested ran a variant of the AT&T SVR4 standard: The SPARCstation ran Solaris 2.1 and OpenWindows 3.1, the Indigo XZ

ran Irix 4.0.5F, the HP Apollo 9000 ran HP/UX 9.01, and the PowerStation 365 ran AIX 3.2. We did not test the Quadra 800 with Apple's version of Unix (AUX 3.1) because so much of the Macintosh's performance comes from Version 7.1 of its Macintosh System Software (System 7.1). We used this operating system for applications testing.

The performance tests run by Workstation Labs strove to eliminate as much as possible the variations caused by the different versions of Unix, and to get a handle on the actual hardware performance of the machines. But we could only go so far with that line of testing, because when you buy any workstation, you are inevitably buying that machine's version of Unix.

WHAT IS UNIX?

Unix had a single inventor, AT&T Bell Labs, which has maintained its influence on successive

versions since the operating system first appeared in 1969. In 1989, AT&T created Unix Systems Labs (85 percent is owned by AT&T), which licensed its Unix versions to vendors. The other prime mover of Unix, The University of California at Berkeley's Division of Electrical Engineering and Computer Science, has had nearly equivalent influence over Unix (releasing modified Unix versions called the Berkeley Standard Distributions, the most recent being BSD 4.3). Novell recently purchased Unix Systems Labs from AT&T (and the rights to Unix) for \$360 million, which could lead to the development of a unified Unix version.

Another development that could increase the acceptance of Unix has been the blending of the AT&T SVR4 and

Berkeley (BSD 4.3) versions by specific hardware and software manufacturers to produce Unix versions containing highlights of both systems. To help foster versions that could be adapted by more manufacturers, several industry groups (such as the Open Software Foundation [OSF] and Unix International [UI]) have created specifications for a "standard" Unix kernel. The kernel is the heart of any Unix implementation: It is the software that talks to the hardware at the most basic level.

Both OSF and UI are attempting to pare Unix down to two standards, which would be a significant achievement considering there were as many as 220 Unix versions in 1982. UI is centering its efforts around the AT&T SVR4 standard, while OSF/1 Unix (which currently emulates BSD 4.3) is being built around IBM's AIX core product (which is based on Carnegie-Mellon University's Mach operating system). The two standards are incompatible, but both contain a number of common elements.

Both OSF and UI have joined X/Open, an international consortium attempting to set a single Unix standard (most recently with its X Portability Guide). All three organizations (OSF, UI, and X/Open) are adhering to the Institute of Electrical and Electronic Engineers (IEEE) Unix standard called Posix. Politics has thus far prevented a single standard from being established, but with the impetus of Novell's ownership and the specter of Windows NT on the horizon, there's a growing possibility that rival vendors will endorse a single Unix standard in the 1990s. (As we go to press, HP, IBM, Sun, and other major Unix vendors have announced the formation of COSE [Common Open Software Environment], organized for just that purpose.) A unified Unix would make all Unix workstations more attractive platforms for the kinds of productivity appli-

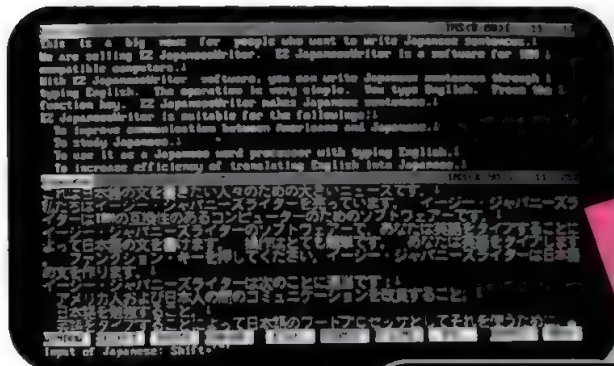
*Politics has
prevented it thus
far, but there's a
possibility that
rival vendors will
endorse a single
Unix standard in
the 1990s.*

Our Contributors: MICHAEL J. MILLER is editor-in-chief of *PC Magazine*. NICK STAM is a technical director (Hardware) at PC Magazine Labs. ALAN BUCK compiled and analyzed performance test results for PC Magazine Labs. DON CRABB is a director of laboratories and a senior lecturer at the University of Chicago. BERNARD J. DAVID is president of General Information Services. DANIEL TABAK is a professor of electrical and computer engineering at George Mason University. DAVID WILSON is the president of Workstation Labs. MICHAEL NEUBARTH was the associate editor in charge of this story, and JON HILL was the project leader.

EZ JAPANESE WRITER™

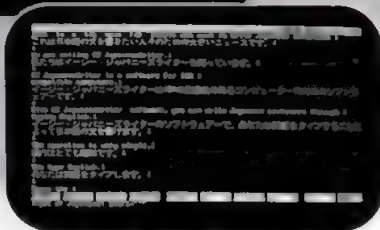
The Software Which Makes Writing in Japanese as Easy as Typing in English

Now, the software which provides the basic English-to-Japanese translation is available for IBM compatibles.



English and Japanese window

IBM
Compatible Software



Combined English / Japanese window

日本語を書く

ソフトウェア

\$1200
First Version \$300



Q1. How does the software work?

A1. Type an English sentence in the English window and the translated Japanese sentence is displayed. Then, in the Translation-Fine-Tuning mode, you can select the appropriate Japanese word relying on the given English definition, rephrase sentences, and add new words into User Dictionary etc.

Q2. Is it a translation software?

A2. Although EZ JapaneseWriter® has a basic capability of translation from English to Japanese, it is not enough to translate your English since it is made without consideration for computer translation. EZ JapaneseWriter® should not be used to translate complicated sentences such as a legal contract, an official document, or a sales brochure. However, EZ JapaneseWriter® greatly increases productivity of a translator.

Q3. Is the translation word-for-word, or sentence-to-sentence?

A3. Sentence-to-sentence.

Q4. How accurate is the translation?

A4. It could be 60% to 100% depending on the structure and vocabulary of your sentence.

Q5. How can I make sure that the translated Japanese correctly relays the message to my receiving party?

A5. EZ JapaneseWriter® displays/prints in the combined English and Japanese format in which an English sentence is immediately followed by the corresponding Japanese sentence, one by one. When you send your fax/letter in this format, it will allow the Japanese to grasp the essential points by scanning the Japanese version and then reviewing the English, if required, in more detail. As a result, you can get a quicker response from Japan.

Q6. Japanese uses Kanji, Hiragana and Katakana. Which characters does EZ JapaneseWriter® use?

A6. All of the three different characters are properly mixed.

Q7. I understand that Japanese uses thousands of Kanji. How can a computer handle Kanji?

A7. EZ JapaneseWriter® software includes Japanese font files or KanjiBoard™ in which the Kanji fonts are stored.

Q8. How about terminology and names?

A8. In addition to 60,000 vocabularies in the system dictionary, you can add up to 30,000 words into the User Dictionary. You can create as many User Dictionaries as you want and choose one for translation.

Q9. Can I import the files made by a word-processing software?

A9. Yes. You can load any ASCII text file into the English window. Similarly, the translated Japanese sentences are saved on Japanese industry standard text files which are compatible with most Japanese softwares.

EJ Bilingual Inc.

A JOINT VENTURE BY NIPPON TEXA CO., LTD. AND KAMEJIMA & TAYLOR ASSOCIATES, INC.
2463 Torrance Blvd., Suite #1, Torrance, CA 90501

Tel: 310/320-8139 • Fax: 310/320-3228

Visit our booth at

COMDEX/SPRING ATLANTA #2851

COMDEX/CANADA TRONTO #C251

日本語版「E・J BANK」 亀島産業 (株)

SYSTEM REQUIREMENT

- **COMPUTER:** IBM PC/PS2 compatible • **VIDEO:** VGA (640X480) color or monochrome monitor
- **PRINTER:** EPSON LQ570 (24pin) or HP LaserJet II/III with 2MB optional memory board/compatible
- SOFT FONT version** DOS 4.1 or higher, 2MB RAM (XMS or EMS), 4MB Hard disk space
- KanjiBoard version** DOS 3.3 or higher, 640K RAM, 3MB Hard disk, one AT Bus expansion slot

EZ JapaneseWriter® is a registered trademark of Kimihira & Taylor Associates, Inc.. KanjiBoard™ is a pending trademark of EJ Bilingual Inc.. EZ JapaneseWriter® is a computer program copyrighted by Kamejima Sangyo Co., Ltd.. IBM is trademark of International Business Machines Corporation.

CIRCLE 059 ON READER SERVICE CARD

cations that we all take for granted on our PCs. Currently, particular applications run only on specific versions of Unix.

WHAT DID WE TEST?

Our test-bed PC was one of the fastest we could lay our hands on: a Compaq Deskpro 5/66M Model 510 using the new Intel Pentium CPU (also called the 80586), and equipped with an ATI Graphics Ultra Plus board for tests requiring 24-bit images and an EISA QVision video card for other testing. We chose this machine because of its overall speed, expandability, and high performance.

Against this hot PC, we stacked up mainstream platforms that you might be tempted to buy instead of a PC, especially in view of the new pricing realities that have arisen for Apple and other non-PC platforms during the last year. You can now buy a fully equipped workstation or high-end Macintosh for much less than the \$10,000 and beyond that such a machine would have cost in 1992.

The other players in our tests were the

HP Apollo 9000 Model 715/50, Hewlett-Packard's updated RISC-based workstation that picks up where the original HP Apollo series left off; the IBM RS/6000 PowerStation 365, a successor to IBM's first-generation RS/6000 RISC workstation; the Silicon Graphics Iris Indigo R4000 XZ, an update to the successful Indigo machine with much better performance and both GIO/64 and EISA buses; the low-end Sun SPARCStation LX, which served as a workstation counterpart to high-end PCs; and the Macintosh Quadra 800, Apple's latest 68040 high-end Macintosh that's based on the Motorola CPU running at 33 MHz.

HOW MUCH DO THEY COST?

The Quadra 800 was among the least expensive units tested. As equipped, the system is priced at \$8,690, including a 33-MHz 68040 CPU, 24MB of RAM, a 230MB hard disk, built-in Ethernet and SCSI interfaces, and a 16-inch Apple color monitor. System 7.1 came installed.

The Indigo XZ was the budget buster among the tested machines, checking in

at \$30,200 for a machine with 32MB of RAM, a 1.2GB hard disk, a 0.25-inch DAT drive, an internal 3.5-inch floppy disk drive, an external CD-ROM drive, a 19-inch color monitor, and the XZ graphics subsystem equipped with 5MB VRAM, a SCSI interface, and built-in Ethernet. You pay another \$1,200 for a C compiler, and \$1,195 for a FORTRAN compiler.

The PowerStation 365 came in with a list price of \$23,435. For that price you get a machine with a 50-MHz IBM Power RISC CPU, 32MB of RAM, a 19-inch color monitor, a 1GB hard disk, a SCSI interface, and built-in Ethernet. You also get the AIX operating system (along with NFS support), a C compiler, and X Window included in the base price. A FORTRAN compiler will cost you an additional \$1,520.

The HP Apollo 9000 was cheaper than the SGI or IBM machines. For a list price of \$17,240, it comes with a 50-MHz HP/PA 1.1 CPU, 32MB of RAM, a 19-inch color monitor, a SCSI-2 interface, a 1GB hard disk, built-in Ethernet, and the

High-speed even at
distances up to 1200'

Printer Sharing that's so Smart, it's Simple.

It's smart to share printers. Now, it's also simple. The SmartPrint Printer Sharing Network comes with everything you need. Simply plug the computer and printer modules into your parallel printer ports and snap in the wires. That's it!

SmartPrint takes it from there. It's all automatic. You don't need to think about SmartPrint again—until you decide to add another printer or user. Then just pick up another SmartPrint module and plug it in.

It's that simple because SmartPrint is that smart.

Call 1-800-368-7737
for the SmartPrint
dealer nearest you.



SmartPrint is made in the USA and carries a full three-year warranty. SmartPrint is distributed to dealers through Ingram Micro and can be found or ordered at most computer stores.

Manufactured by:
Dresselhaus
COMPUTER PRODUCTS

10241B Trademark Street
Rancho Cucamonga, CA 91730
Tel: (909) 945-5800
Fax: (909) 989-2436

BONUS
File
transfer
software
FREE

SmartPrint Starter Kit
2 computer modules, 1 printer
module, wire, AC adapter \$199
Add-on Computer Module \$50
Add-on Printer Module \$60

Windows at your fingertips.

WinBook, the first notebook computer designed specifically for Windows.

The new WinBook™ gives you all the power to run Windows, and the unique design to make it easier to use.

It features a built-in, centered trackball, which allows you to control cursor movements effortlessly with either thumb—without having to lift a single finger off the keyboard.

And the WinBook comes with the power and speed needed to run Windows effectively. You get 4MB of memory, the new ultrafast 486 SLC/E 25-MHz processor and the Motorola chipset which provides eight power-saving features, even while running Windows.

The WinBook was engineered for Micro Electronics, a division of MEL/Micro Center, Inc. MEL is America's

leading direct source for computer accessories. Micro Center has been selling PCs for more than 14 years—longer than IBM or Compaq—with over 736,000 units sold. And with over 2.2 million satisfied customers nationwide, they have developed a superior support staff, including top engineers and technical specialists. So you always get the highest quality product at the lowest possible price.

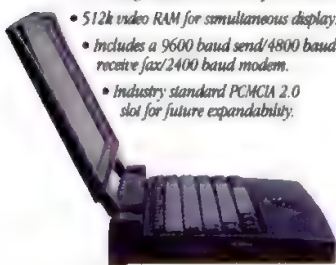
Before you choose a notebook computer, look at the only one designed for Windows.

The WinBook from Micro Electronics

—putting Windows at your fingertips.

The 5.4 lb. WinBook was designed by award-winning Palo Alto Design.

- Fast-acting Hitachi LCD screen for no cursor loss.
- 512k video RAM for simultaneous display.
- Includes a 9600 baud send/4800 baud receive fax/2400 baud modem.
- Industry standard PCMCIA 2.0 slot for future expandability.



Eight Power-Saving Features

Including sleep mode for all I/O ports, HDD, and FDD to increase battery life



Docking Station

With the available docking station, your WinBook instantly becomes a full-function desktop computer. Its two expansion slots allow you to add peripherals such as monitors, hard drives, CD ROMs or an extended keyboard. And it's just \$399!

Specifications

- Size/Weight**
- 11" x 8 3/4" x 1 3/4"
 - 5.4 lbs with battery
- Pointing Device**
- 16mm Alps dual-action, Microsoft compatible internal trackball
- Battery**
- 4 hours under normal usage
 - Sanyo NiMH (no memory effect)
 - 2300 MA with gold-plated contacts
 - Worldwide auto-sensing AC adapter
 - Quick 2-hour recharge
- Power Management**
- 8 power-saving features

- Processor & Memory**
- 486 SLC/E-25 CPU
 - 4 MB RAM
 - 1 MB ROM for Ami BIOS
 - Motorola chipset & Cirrus VGA 6420
 - 1k Internal Cache
- Drives**
- One built-in 1.44 MB 3.5" floppy drive
 - Internal 120 MB (15ms) hard drive
 - 250 MB (15ms) hard drive optional
- Software**
- Comes loaded with MS-DOS 6.0 and Microsoft Windows 3.1

- Display**
- Super-twisted 64 gray scale, 10" LCD with CCFT-backlit
 - 640x480 VGA resolution for LCD and 1024x768 for external monitor with 512k simultaneous display
 - Adjustable contrast and brightness
 - Visible LED indicator on cover-down
- Keyboard**
- Full-function keyboard with 85 keys and 4 inverted-T cursor control keys, 3.0 mm keyboard spacing

- Modem**
- Fax-9600 baud send/4800 baud receive/2400 baud modem
- I/O Ports**
- PCMCIA 2.0 slot
 - Serial 9-pin connector
 - Parallel port
 - Video 15-pin connector for CRT
 - 160-pin docking station
 - PS/2 mouse interface/keyboard interface
- Options**
- 250 MB (15ms) hard drive
 - 8 MB RAM
 - Coprocessor
 - Docking station

The WinBook for only

\$1699

- 486 SLC/E 25 MHz
 - 120 MB (15ms) HDD
 - 4 MB RAM
 - Fax Modem
- \$1499**
- 80 MB (15ms) HDD
 - 2 MB RAM
 - Fax modem, Windows optional

CIRCLE 085 ON READER SERVICE CARD

No-risk, 45-day unconditional money-back guarantee.

Order the WinBook today. Call 1-800-468-2139

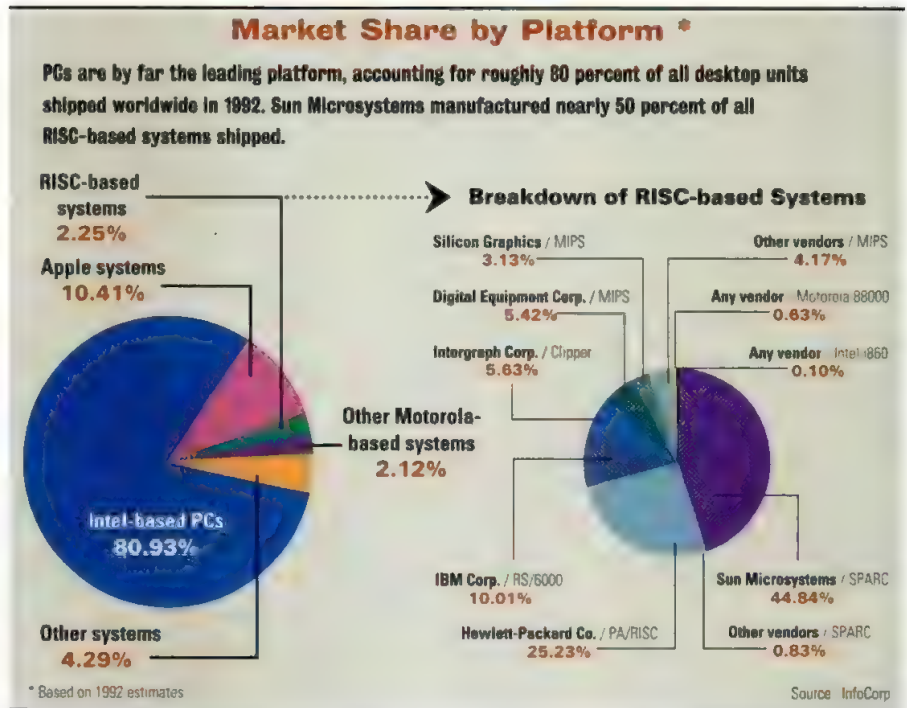
Micro Electronics, a division of MEL/Micro Center, Inc. • 1180 Steelwood Rd • Columbus, OH 43212 • Fax: 1-800-449-0300 • 9am-9pm EST, Monday through Friday • 9am-4pm EST Saturday

HP/UX 9.01 operating system (including NFS support). Extra copies of the operating system cost \$415. Both the C and FORTRAN compilers are pricey: \$2,090 for the C development system, and \$2,095 for FORTRAN.

The SPARCstation was the cheapest of the midrange Unix workstations, costing \$10,395 (plus an additional charge for its 32MB of RAM) for a model offering a 19-inch color display with built-in GX graphics acceleration, a 50-MHz micro-SPARC CPU, a 424MB hard disk and a SCSI interface. The machine also included built-in Ethernet and NFS support. You must pay \$40 for the media containing the operating system, plus \$675 for a C compiler and \$999 for a FORTRAN compiler. For about half the price of the LX (\$5,495) you can buy the similarly equipped Sun SPARCclassic we tested, which lacks the GX graphics acceleration feature but constitutes a bargain in the world of Unix workstations.

The Deskpro 5/66M hadn't been formally priced at press time, but we expect it to list for about \$8,000 with a 66.7-MHz Pentium CPU, 32MB of RAM, a 20-inch VGA color monitor, a 360MB hard disk, and an IDE hard disk interface. Our test machine lacked built-in Ethernet and SCSI interfaces. When tested running SCO Unix 3.2, Version 4.0, the unit also lacked NFS, so we could not perform server network tests. If you were to run SCO Unix, you would need a larger hard disk (we recommend 1GB) because of the size of the SCO OS (about 300MB). Most Deskpro 5/66M's will ship with DOS 6.0 and Microsoft Windows 3.1 installed.

The problem in comparing the prices of these systems is that you receive different levels of accoutrements: different depth color monitors, different size hard disks, CPUs that range in speed from fast to extremely fast, and so on. The key to comparing workstations and PCs is to choose a PC configuration you want to live with, then ask your workstation vendor to price a comparable configuration. All things being equal, the overhead of Unix requires more RAM and hard disk space to run versus DOS, Windows, or even OS/2.



HOW DID WE TEST?

We tested the Unix machines by contracting with Workstation Labs (WSL), who verified the hardware and software configurations of each machine, then set about the laborious process of installing a suite of low-level testing programs on each machine. Because of the extreme performance hit the Quadra 800 takes when running Apple's AUX 3.1, Workstation Labs did not test the Quadra 800. More than 98 percent of Macintosh users run their

addition, we ran Stanford multiprocessing tests to gauge the multiprocessing ability of the machines, and an AutoCAD test that was developed by Chris DeLucchi of the San Diego AutoCAD User's Group.

Since we did not run low-level performance tests on the Quadra 800, we decided to compare the Deskpro 5/66M running Windows 3.1 to the Quadra 800 running System 7.1 with a series of applications tests. The test suite included word processing (Microsoft Word and Word Perfect), spreadsheet (Lotus 1-2-3 and Microsoft Excel), desktop publishing (Aldus PageMaker), and image rendering (Pixar's Typestry). This would

help us evaluate the Mac's performance against the workstations because we had run most of the low-level tests on the Deskpro 5/66M running SCO Unix.

WSL ran an exhaustive series of performance tests on each Unix machine to determine its basic CPU, graphics, networking, and hard disk performance.

machines under System 7.1, which comprises a major portion of the Macintosh's value.

WSL ran an exhaustive series of performance tests on each Unix machine to determine its basic CPU, graphics, networking, and hard disk performance. These tests, which are summarized in our "How We Tested" section, included Dhrystone, Graphstone, Khornerstone, a SPECmark test suite, the pair of Whetstone tests, X11PERF, and Mandel and other floating-point and integer tests. In

WHAT DID WE FIND?

Overall, the Compaq machine did well in applications development, connectivity, and office productivity. The Quadra 800 excelled at desktop publishing, and did less well at connectivity, 3-D graphics, and office productivity—although its scores for these tasks were still high. The

HUNDREDS
OF COMPANIES
CAN SELL YOU
A COMPUTER
THROUGH THE
MAIL.

BUT THERE'S ON THAT CAN DE



Announcing COMPAQ DirectPlus, a way for you to get the quality and reliability Compaq is known for, through the convenience of buying direct. We offer popular COMPAQ PCs and the industry's leading software, all at competitive prices—the kinds of products you've asked for based on your computing needs. That's the idea behind COMPAQ DirectPlus: to deliver the quality and flexibility you want, without expanding your budget.

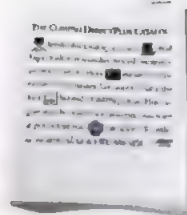
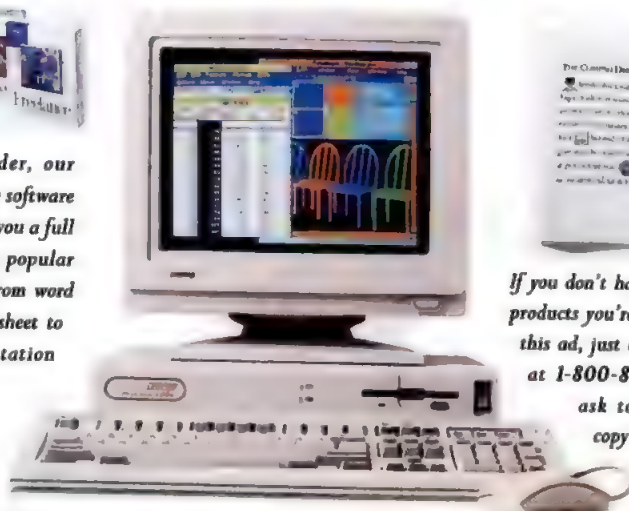


Known for quality and reliability, Compaq offers you some of the best-engineered computer products in the industry—at very attractive prices. Everything from innovative notebook PCs to versatile desktops.

LY ONE COMPANY LIVER ALL THIS.



As an industry leader, our alliances with leading software companies let us offer you a full selection of the most popular software, everything from word processing and spreadsheet to database and presentation graphics.



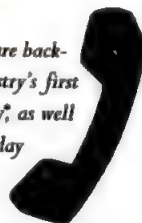
If you don't happen to see the products you're looking for in this ad, just call us toll-free at 1-800-888-5886 and ask to receive your copy of our catalog.



Our service and support options offer everything from on-site installation by a Compaq-authorized technician to on-line diagnosis of technical problems on your PC.

We've put together a variety of special solutions for you. All of them are competitively priced and well-suited to the kinds of business functions you perform every day.

All of our PCs are backed by the industry's first 3-year warranty*, as well as 24-hour, 7-day technical hot-line support.



Many of the popular software titles we offer you can be pre-installed onto any computer that you purchase from us—at no additional charge.



We give you lots of choices, including a leasing program and a trade-in option that lets you trade in select COMPAQ, Apple and IBM PCs. We also offer a variety of purchasing options.



Call 1-800-888-5886 and talk to an Account Representative who's trained to help you decide what products and service options are best for your particular requirements.

COMPAQ
DirectPlus

1 800 888-5886

*Certain restrictions and exclusions apply, see next page.

WHY BUY JU COMPUTER WHEN COMPAQ AT PRIC

All our PCs are backed by the COMPAQ free 3-year warranty¹—the first such warranty in the industry. We can offer this kind of long-term guarantee because of our quality and testing standards. Prices include COMPAQ Monitors. Call for details on other COMPAQ desktops and notebooks, as well as printers.



COMPAQ ProLine 3/25s
25-MHz 386SX, 2-MB RAM, 120-MB hard drive, VGA Color Monitor. An affordable entry-level desktop PC.



¹Restrictions and exclusions apply. Monitors, battery packs and certain options are covered by a one-year warranty. *Leasing is provided by GE Capital Corporation for a term of 36 months, and is subject to approved credit and certain terms and conditions. Call for details. **Requires a 1024 Color Monitor.

ST ANOTHER YOU CAN GET A ES LIKE THESE?



COMPAQ ProLinea 4/25s
25-MHz 486SX, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. Great for everyday business applications.



COMPAQ ProLinea 4/33
33-MHz 486DX, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. Designed for more advanced applications.



COMPAQ ProLinea 4/66
66-MHz 486DX2, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. For high performance at an affordable price.

ProLinea Features

- 3½" 1.44-MB diskette drive
- ♦ 1024 x 768 local bus video graphics with 1-MB VRAM in up to 256 colors (on 486 models) ♦ 3 expansion slots
- ♦ 3 internal storage device positions ♦ Security features
- ♦ COMPAQ Color Monitor, preinstalled MS-DOS 6.0 and Microsoft Windows 3.1 and a COMPAQ Mouse.

DESKPRO/i Features

- 3½" 1.44-MB diskette drive
- ♦ Integrated QVision Graphics displays up to 256 colors at 1024 x 768 with 512-KB VRAM option** ♦ 3 expansion slots ♦ 3 internal storage device positions ♦ Security features
- ♦ Business Audio ♦ COMPAQ Color Monitor, preinstalled MS-DOS 6.0, Microsoft Windows 3.1 & Sound System Software, COMPAQ Mouse & Microphone.



COMPAQ DESKPRO 4/25is
25-MHz 486SX, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. Delivers fast, high-resolution graphics in Windows.



COMPAQ DESKPRO 4/33i
33-MHz 486DX, 4-MB RAM, 120-MB hard drive, SVGA Color Monitor. For even faster performance in a Windows environment.



Contura Features

- 3½" 1.44-MB diskette drive
- ♦ Power conservation and security features ♦ Battery
- ♦ AC Adapter ♦ Preinstalled MS-DOS 6.0, Microsoft Windows 3.1 and EZ Help On-Line Library and a COMPAQ Trackball.



COMPAQ Contura 3/25
25-MHz 386SL, 4-MB RAM, 120-MB hard drive, monochrome VGA display, 6.2 lbs. An affordable notebook loaded with features.



COMPAQ Contura 4/25
25-MHz 486SL, 4-MB RAM, 120-MB hard drive, monochrome VGA display, 6.2 lbs. Upgradeable to Active Matrix Color Display.

COMPAQ
DirectPlus

1 800 888-5886

WE OFFER SPECIAL BUNDLES. THAT'S WHAT

We've put together these bundles to make it easy to get the hardware and software that you need in a complete system, at one special price. No matter what your computing needs, chances are that one of these bundles will fit the bill. Not only that, but the price you'll pay will fit well within your budget.



The Basics Plus.



COMPAQ ProLinea 4/25s
25-MHz 486SX, 4-MB RAM,
120-MB hard drive,
SVGA Color Monitor.



*Data+Fax
Modem*



*WinFax PRO
for Windows*



*Microsoft Works
for Windows*



*Calendar Creator
Plus Windows*



*AfterDark for
Windows*



*Quicken for
Windows*

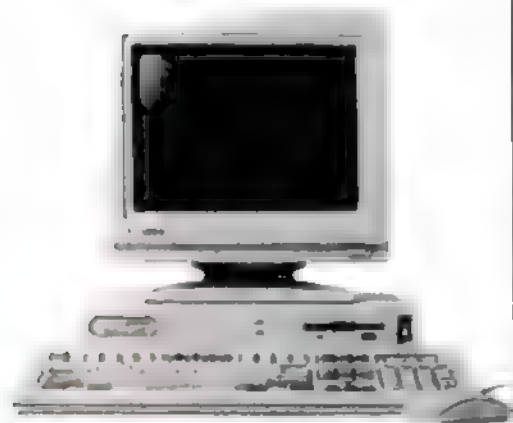
This entry-level system gives you a full range of business and personal applications as well as data and fax communications—all at a surprisingly low price.

\$1,675
Or \$60 per month*

*Leasing is provided by GE Capital Corporation for a term of 36 months, and is subject to approved credit and certain terms and conditions. Call for details.

CIAL SOLUTIONS BECAUSE IN THE END, YOU'LL SAVE.

The Front Office.



COMPAQ ProLinea 4/33
33-MHz 486DX, 4-MB RAM,
120-MB hard drive,
SVGA Color Monitor.



Quattro Pro
for Windows



WordPerfect
for Windows

This general business solution, which is offered to you at a very competitive price, teams up two popular word processing and spreadsheet applications.

\$2,099

Or \$75 per month*

The Windows Office.



COMPAQ DESKPRO 4/33i
33-MHz 486DX, 4-MB RAM,
240-MB hard drive,
1024 Color Monitor.



Extra 2-MB
of RAM



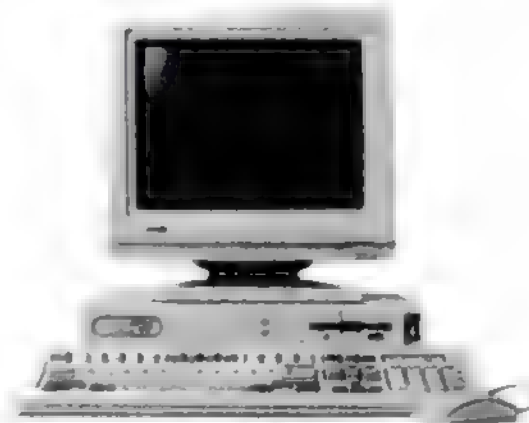
The Microsoft
Office
for Windows

This solution can utilize COMPAQ business audio with the most popular Microsoft applications. The Microsoft Office includes Microsoft Excel, Word, PowerPoint and Mail.

\$2,799

Or \$100 per month*

The Office Pro.



COMPAQ ProLinea 4/50
50-MHz 486DX2, 4-MB RAM,
240-MB hard drive,
SVGA Color Monitor.



Extra 4-MB
of RAM



14.4-Kbps
Data+Fax
Modem



WinFax PRO
for Windows

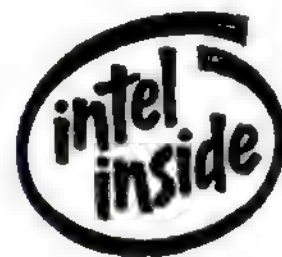


Lotus
SmartSuite
for Windows

This solution offers data and fax communications with popular Lotus applications. Lotus SmartSuite includes Lotus 1-2-3, AmiPro, Freelance Graphics, Organizer and cc:Mail.

\$2,999

Or \$107 per month*



COMPAQ
DirectPlus

1 800 888-5886

NOW, CHOOSING WHAT'S RIGHT FOR YOUR BUSINESS IS AN EASY CALL.

1 800 888-5886

Call us toll-free to inquire
about the quality products
and services that we offer
you at very competitive prices.

Our specially trained Account
Representatives can assist you in
choosing a solution that is right for



your particular needs. If you
don't happen to see the
COMPAQ products
you want in this ad, just call us and

ask about them. Whatever you need,
we're here to help. We look for-
ward to your call.

COMPAQ
DirectPlus

©1993 Compaq Computer Corporation. All rights reserved. Printed in the USA. Compaq, the COMPAQ logo and DESKPRO Registered U.S. Patent and Trademark Office. Contura and ProLinea are trademarks of Compaq Computer Corporation. COMPAQ DirectPlus and CompaqCare are service marks of Compaq Computer Corporation. Products, prices and programs are subject to change without notice. All products are trademarks or registered trademarks of their respective companies. Microsoft and MS-DOS are registered trademarks and Windows is a trademark of Microsoft Corporation. The Intel Inside logo is a trademark of Intel Corporation.CIRCLE 269 ON READER SERVICE CARD

IBM RS/6000 showed its prowess at applications development, connectivity, and engineering tasks, while the Indigo XZ shined at connectivity, desktop publishing, and 3-D graphics.

Of the Unix workstations we tested, our slight favorite was the HP Apollo 9000. It proved to be an excellent machine for applications development and engineering tasks, while its other scores demonstrated that it was well suited for just about any task. The HP Apollo 9000 also nearly matched the aggressive graphics performance of the

Indigo R4000, which is supposedly SGI's bread and butter.

The PowerStation 365 was the leader at floating-point operations. For engineering applications, CAD, and database work, it would be a very good choice. Although the IBM and SGI were strong performers, we found their versions of Unix (AIX and Irix) to be a bit less friendly than the highly versatile HP/UX with its clean Motif GUI.

Although the Indigo XZ was the fastest machine we tested at 3-D graphics, it was also the most expensive. It handled float-

ing-point calculations very effectively making it suitable for engineering and scientific environments. It is no wonder that SGI Indigos are so often used by Hollywood firms for animation renderings.

We were disappointed with the SPARCstation, which fell short of the competition in every respect, save one—connectivity. It was comparatively slow for its \$11,000 list price, and was easily beaten by the Deskpro 5/66M, which is not even optimized for the SCO Unix system we used during the low-level performance tests. It would be suitable as a cli-

■ Preview: *Alpha AXP PC*

by Jon Hill

The Alpha AXP PC's short tower case seems indistinguishable from Digital Equipment Corp.'s Intel-based offering, until you remove the oversized heat sink and discover a 150-MHz version of Digital's Alpha chip (the heat sink is twice as large as that in any Intel-based PC). What makes a PC a PC? Digital is trying to confound that issue with the release of its Alpha AXP PC, a RISC-based computer that will run Microsoft's Windows NT operating system.

Set to be priced between \$7,000 and \$10,000, the AXP promises to deliver 1.5 to 2 times the performance of machines based on Intel's Pentium chip (66 MHz) at the same price. Alpha AXP will house six EISA slots, standard SIMM slots for 12MB to 128MB of RAM, five drive bays, Compaq's QVision graphics controller, an Adaptec SCSI controller, and a 3.5-inch floppy disk drive.

Digital has been shipping workstations based on 150-MHz versions of the Alpha for some time now, but the units currently run only under OpenVMS—hardly a threat to Intel's dominance. Recent announcements of 200-MHz AXP workstations, and the completion of Digital's OSF/1 operating system, will improve the company's position in

the workstation market but are not likely to have much of an impact in the world of PCs.

By the time you read this, however, Digital will be betting that Windows NT running on the AXP PC will redefine what constitutes a personal computer. The installation procedure under NT will ask you to tell it which platform the operating system will be running on: Alpha, Intel, or MIPS. Another clue will be its speed: Digital claims the Alpha AXP PC will be the fastest NT machine in town.



Digital's new AXP PC.

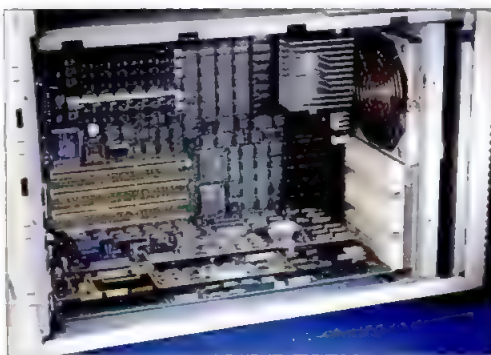
support. Digital claims the integrated unit will deliver between 70 and 80 percent of the performance of its higher-speed cousin, with system prices starting at about \$4,000.

If current projections hold up, you may see Alpha-based laptops by the first quarter of 1994,

and 200-MHz desktop PCs by early next year. In the meantime, Digital is busy rounding up OEMs interested in putting Alpha chips into their own systems, and has begun to license third-party manufacturers of the chip itself.

While Digital seemingly has little interest in putting together a VL-bus implementation—preferring to wait for its PCI-integrated chips to ship—a third-party vendor might decide that a relatively fast VESA card in a super-fast Alpha system would make an attractive high-end product.

One thing is clear: Digital is committed to its Alpha technology. The 100-MHz to 200-MHz current and near-future models are early explorations of what Alpha's stripped-down RISC architecture can achieve. Digital's engineers claim that future Alpha implementations may achieve raw clock speeds approaching a gigahertz as early as 1996. Mind boggling, if true. But is it really a PC? □



AXP's interior shows Alpha's large heat sink.

By the third quarter of this year, Digital plans to release a low-cost version of the AXP PC, wrapped around a 100-MHz version of the Alpha chip that will feature built-in PCI local-bus

SOFTWARE

Product	Media	Price
Spreadsheets		
□ Lotus 1-2-3 Windows 1.1 Item #58836-16	F5	\$ 315
□ Lotus 1-2-3 Windows 1.1 Item #61837-16	F3	\$ 315
□ Lotus 1-2-3 Windows 1.1 Upgrade Item #54832-16	F3	\$ 99
□ Microsoft Excel for Windows 4.0 Item #53253-16 (5.25 available)	F3	\$ 299
□ Microsoft Excel for Windows 4.0-Upgrade Item #44625 (5.25 available)	F3	\$ 119
□ Lotus 1-2-3 2.4 Item #67606-16	F3	\$ 335
□ Lotus 1-2-3 2.4 Item #69601-16	F5	\$ 335



\$99 Lotus 1-2-3 Upgrade

Word Processing

□ WordPerfect 5.2 for Windows Item #77919-19 (5.25 available)	F3	\$ 275
□ WordPerfect 5.2 for Windows-Upgrade Item #57683-19 (5.25 available)	F3	\$ 79
□ Microsoft Word for Windows 2.0b Item #64932-19 (5.25 available)	F3	\$ 299
□ Microsoft Word for Windows 2.0b-Upgrade Item #62910-02 (5.25 available)	F3	\$ 119

Product	Media	Price
Word Processing Con't		
□ Lotus Ami Pro 3.0 Item #55236-19	Dual	\$ 249
□ Lotus Ami Pro 3.0 Upgrade Item #32259-19	Dual	\$ 99
Database		
□ Borland Paradox 4.0 Item #63329-08	F3	\$ 499
□ Borland Paradox 4.0 Item #63325-08	F5	\$ 499
□ Borland Paradox 4.0 Upgrade Item #89829-08	F3	\$ 185
□ Borland Paradox 4.0 Upgrade Item #91828-08	F5	\$ 185
□ DataEase Express for Windows Item #85902-11	F3	\$ 145
□ Symantec Q&A 4.0 Item #95743-13	F3	\$ 249
□ Symantec Q&A 4.0 Item #17461-13	F5	\$ 249

Presentations/Graphics

□ Lotus Freelance Graphics for Windows Item #29190-10 (5.25 available)	F3	\$ 339
□ Lotus Freelance Graphics for Windows-Upgrade Item #00802-10 (5.25 available)	F3	\$ 99
□ Harvard Graphics for Windows 1.01 Item #37744-10	F3	\$ 349
□ Harvard Graphics for Windows 1.01 Item #89734-10	F5	\$ 349
□ Microsoft PowerPoint 3.0 Item #12531-03	F3	\$ 299
□ Microsoft PowerPoint 3.0 Item #82528-03	F5	\$ 299
□ Aldus Persuasion 2.1 Item #77993-03	F3	\$ 315
□ Aldus Persuasion 2.1 Item #83997-03	F5	\$ 315
□ Spinnaker PFS: Publisher for Windows Item #38927-04	F3	\$ 89

Product	Media	Price
Integrated		
□ Lotus SmartSuite Item #71818-13	F3	\$ 459
□ Lotus SmartSuite Item #73818-13	F5	\$ 459
□ Microsoft Office 3.0 Item #36837-13	F3	\$ 459
□ Microsoft Office 3.0 Item #49836-13	F5	\$ 459
□ Spinnaker PFS: WindowWorks 2.0 Item #40941-13	F3	\$ 75

General

□ Chipsoft TurboTax for Windows Headstart Item #73918-02	Dual	\$ 47
□ Chipsoft TurboTax for DOS Headstart Item #00635-02	Dual	\$ 47
□ Intuit Quicken 6.0 Item #79785-02	Dual	\$ 39
□ Intuit Quicken for Windows 2.0 Item #45870-02	Dual	\$ 29
□ Intuit Quickbooks Item #38392-02	Dual	\$ 89
□ IBM OS/2 2.0 Item #23449-17	F5	\$ 139
□ IBM OS/2 2.0 Item #26442-17	F3	\$ 139
□ Symantec Norton Desktop for Windows 2.0 Item #88164-11	F3	\$ 109

Product	Media	Price
General Con't		
□ Symantec Norton Desktop for Windows 2.0 Item #63129-11	F5	\$ 109
□ Quarterdeck QEMM 386 Item #45010-17	F3	\$ 59
□ Quarterdeck QEMM 386 Item #42019-17	F5	\$ 59

PERIPHERALS AND ACCESSORIES

Multimedia

□ Creative Labs Multimedia Upgrade Kit Item #30738-25	Int	\$ 549
□ Creative Labs Sound Blaster Pro Item #61991-54	Int	\$ 189
□ MediaVision Pro 16 Multimedia System Item #23507-54	Int	\$ 899
□ MediaVision Multimedia Upgrade Kit Plus Item #38504-54	Int	\$ 735
□ MediaVision Fusion 16 Multimedia Upgrade Kit Item #88934-25	Int	\$ 499
□ MediaVision Pro Audio Spectrum 16 Item #01507-54	Int	\$ 199



\$239

PFS Printer
Bundle: Item
PFSPRN

• Includes Epson 3250 Printer, PFS
WindowWorks, and PFS Publisher.

INTRODUCING DELLWARE. PRICES FROM SOMEONE YO

Same low prices. Same great software and peripherals. So, who would you rather buy them from—some anonymous discounter, or a FORTUNE 500® company like Dell? That's what we thought.

Now in addition to award-winning computers, we offer over 2,400 items

for your system (including software, peripherals and accessories), all at everyday low prices. Naturally, all are backed by the unmatched personal support and service Dell is known for. We call this DellWare™.

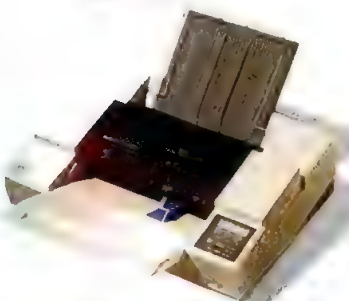
You'll call it a welcome change from combing the backs of your computer

magazines for bargains.

Our trained representatives take the time to get to know you and your computer system, and will help you find exactly what you need.

Since you'll want to start using your new products immediately, we'll ship them to you by the next business

Product	Media	Price
Modems		
Cardinal Technologies 2400 w/Prodigy Kit Item #000666-41	Int	\$ 39
Practical Peripherals 2400 SA 9600Fax Item #55492-41	Ext	\$ 109
Practical Peripherals 9600 SA w/QuickLink II Item #17710-41	Ext	\$ 305
Hayes Optima 96/Smartcard EZ .32/42BIS Item #60063-41	Ext	\$ 349
Cardinal MB14400 V.32 w/Turbofax V.42 Item #40355-41	Ext	\$ 309



Lexmark Model 4079 Color Jet Printer

Input Devices

Logitech Mouseman Cordless Serial PS/2 Item #62063-35	\$ 87
Logitech Mouseman Serial PS/2 RH Item #75010-35	\$ 67
Microsoft Mouse-Bus Item #81453-35	\$ 89
Microsoft BallPoint Mouse w/Windows 3.1 Item #55034-35	F3 \$ 149
Logitech Scanman Model 256 Item #46485-53	\$ 263
The Complete PC Complete Page Scanner w/OCR Item #41725-53	\$ 549

\$189 Sound Blaster Pro

Monitors

NEC Multisync 3FGX Item #55195-23	\$ 689
NEC Multisync 4FG Item #75319-23	\$ 799
Radiux PrecisionColor Display 19 Item #89497-23	\$ 2,229
Dell UltraScan 14C Item #320-3364	\$ 449
Dell UltraScan 15FS Item #320-3369	\$ 549

Printers

IBM/Lexmark Personal Printer II 9Pin 80Col Item #99025-27	\$ 349
IBM/Lexmark Personal Printer II 24Pin 80Col Item #87025-27	\$ 349
Epson AP-3250 Item #330-1482	\$ 205
Canon BJ-10 Ink Jet Item #72069-28	\$ 329
IBM/Lexmark Color Jetprinter 4079 II Item #12993-28	\$ 2,749
IBM/Lexmark 4070 II Item #79832-28	\$ 375
Epson EPL-8000 Item #330-3347	\$ 1,159



Printers Con't

IBM/Lexmark 4019 Laser Printer Item #79641-37	\$ 849
Genicom Model 7170 Item #12844-37	\$ 3,215
Okidata OL400P LED Page Printer Item #70695-37	\$ 649
Texas Instruments MicroLaser Basic Item #13399-37	\$ 899
Texas Instruments MicroLaser PS17 Item #12814-37	\$ 1,215

Storage

Quantum Prodrive ELS 85MB IDE Item #03731-34	Int \$ 215
Quantum Prodrive ELS 127MB IDE Item #09734-34	Int \$ 289
Quantum Prodrive ELS 170MB IDE Item #16736-34	Int \$ 325
Conner Soft-Star 3170 Item #76828-34	Int \$ 565
Colorado Jumbo 250 DJ-20 Item #88977-26	Int \$ 269

Product	Media	Price
Storage Con't		
Imega Tape 250 Insider Halfheight Item #35848-34	Int	\$ 249

Networking

Artisoft Lantastic Windows Utility 4.1 Item #20664-36	Dual	\$ 179
Artisoft Lantastic Starter Kit 4.1 Item #89634-36	Dual	\$ 489
Novell Netware Lite 1.1 Item #02829-36	F5	\$ 59
Novell Netware Lite 1.1 Item #01827-36	F3	\$ 59
Windows for Workgroups Item #13151-17	F5	\$ 159
Windows for Workgroups Item #13166-17	F3	\$ 159
SMC Ethercard +Elite 16 Combo Item #23477-36	Int	\$ 198
SMC Ethercard +Elite 16T Int Item #11544-36		\$ 145
IBM Token Ring 16/4 Item #89733-36	Int	\$ 549



CALL TODAY

Featured here is just a sampling of
our thousands of products. To see more,
call today for a free catalog.

NOW YOU CAN GET LOW U'VE ACTUALLY HEARD OF.

day for only five dollars.

Of course, we'll also solve any
problems you may have installing the
products you buy from us. And if you
order software, we'll even enter your
name on AppTrac™ (DellWare's
application tracking program) and let
you know ahead of time when new

versions are coming out, so you can
upgrade accordingly.

To order something from above (or
to ask for a free catalog featuring the
complete DellWare selection), simply
phone toll-free. And forget about those
other guys.

Whatever their name is.

DELL™

800-545-1589

WHEN CALLING, PLEASE REFERENCE #11BFJ.
HOURS: 7AM-9PM CT MON-FRI, 8AM-4PM CT
SAT, 10AM-3PM CT SUN

Benchmark Tests: Workstation Platforms

While midrange workstations from HP, IBM, and Silicon Graphics stood out on our tests, the Pentium-based Compaq is a viable contender.

Our PC/Mac Applications test results show that the Pentium-based Compaq Deskpro 5/66M has lapped its Macintosh competition, even in domains once thought of as belonging solely to the Mac. The Compaq unit rendered our 24-bit Typestry sample eight times as fast as the Apple Macintosh Quadra 800. The ATI Graphics Ultra Plus board we installed in the Compaq for this test was an ISA card (we replaced the EISA Compaq QVision card in order to render a 24-bit image at 800-by-600 resolution); although capable, it is by no means the fastest 24-bit PC graphics card available. Most of the performance gains for this type of processing come from the Pentium's improved FPU (floating-point unit) and enhanced processor cache.

While the Pentium chip's performance puts the PC on the same playing field as the other workstations in this roundup, PC performance still lags behind the performance of midrange workstations in many areas. Although SPECfp92 floating-point performance was much improved (the Compaq performed three times as fast as a 486-DX2/66 tested previously under similar conditions), it was less than half that of either the HP or the IBM unit we tested, and roughly half that of the Silicon Graphics unit. The compilers used during our testing have not been optimized for the Pentium, but neither have the applications that users are likely to run.

The Compaq's disk-intensive test scores—a factor in the Khornerstone test results—also suffered from SCO Unix's poor use of disk buffers. Moreover, as the Graphstone scores show, the Compaq QVision graphics board paled in comparison with the HP Apollo 9000's X11 graphics accelerator and was completely overshadowed by the performance of the Indigo XZ's GL graphics processor. The Sun SPARCstation LX performed well only on the Stanford Recursion test suite.

The midrange workstations from Hewlett-Packard, IBM, and Silicon Graphics clearly outperformed the other units in this roundup. The HP Apollo 9000 was arguably the best-rounded performer. While the IBM RS/6000 PowerStation 365 performed well in every category except graphics, it excelled at floating-point operations and multiprocessing capacity. And we found the Indigo XZ, justly famous for its 3-D graphics engines, to be equally adept at floating-point operations.

How We Tested

WSL, an independent testing facility well known in the Unix world, conducted much of the testing for this roundup. The full suite of tests is available on ZiffNet (11PLAT.ZIP) in Library 2 (Features Hardware) of the Editorial Forum. The Compaq 5/66M ran SCO Open Desktop, Release 2.0, for the Unix-based tests; other system configurations (and the compiler switches used for the SPECmark tests) are specified in our fact files. WSL did not test the Apple Macintosh Quadra 800; much of the Mac's performance is tied to System 7.1, and Unix-based scores would be misleading at best.

Dhrystone, Version 2.0, is a series of CPU-intensive tests written in C. They are most useful for measuring the performance of systems' programming applications. We report a composite score for each product.

Graphstone is a series of 125 routines, testing 13 different graphics types (such as lines, filled and unfilled polygons, circles, and arcs). The tests are weighted, and we report a composite score for each product. All products were tested using X11 library calls; the Indigo XZ was also tested under its native GL graphics library.

Khornerstone results are calculated from 21 tests that stress each workstation's CPU, FPU, and disk subsystem.

SPECmark SPEC89 is a suite of ten CPU- and FPU-intensive tests supplied by Systems Performance Evaluation Cooperative (SPEC). SPECmarks are a measure of relative performance, where the VAX11/780 is defined as a 1-SPECmark machine. **SPECmark SPECfp92** and **SPECmark SPECint92** are newer versions of the SPEC tests that return separate results for floating-point and

integer operations, respectively.

The single-precision and double-precision **Whetstone** tests are designed to simulate the FPU-intensive programs used in engineering and scientific computing.

X11PERF is a graphics test based on the classic public-domain test of an X11 server.

At PC Labs, we ran ten Unix-based "Stanford" test routines, which characterize multiprocessing capability. Each routine is run as a single process and then as 2, 4, 8, and 16 concurrent processes. We classified the tests into three groups (floating-point, integer, and recursive operations); each point plotted on our graphs represents a product's average timing within the group of tests.

Fast Fourier Transformation and **Floating-Point Matrix Multiply**, part of our **Stanford Floating-Point** test suite, are two standard gauges of floating-point performance. These routines are similar to code used in three-dimensional transformations, two-dimensional image enhancement, and scanning routines. **Mandel** is the FPU-intensive Mandelbrot algorithm, a form of matrix multiplication using complex numbers.

Our **Stanford Integer** test suite is made up of **Bubble**, which implements the standard bubble-sort algorithm using two nested loops; **Integer Matrix Multiply**, which performs a matrix multiply on integer arrays; and **Puzzle**, a compute-bound algorithm that employs many nested loops.

The **Queens**, **Quick**, **Towers**, and **Tree** algorithms, which form our **Stanford Recursion** test suite, perform numeric compares on simple data structures with almost no math involved.

The **AutoCAD** tests, developed by the AutoCAD Users Group of San Diego, measure elapsed times for 18 CAD operations. We normalize each individual test result against the slowest performer on the test in question; we then weight these preliminary results and compute a harmonic mean. AutoCAD is not available for the Silicon Graphics unit. Version 11 is the most recent release available for the Apple Macintosh Quadra 800; we used AutoCAD, Release 12, for the remaining systems.

To compare the Deskpro 5/66M, running Windows 3.1, with the Quadra 800, PC Labs developed a **PC/Mac Applications** test suite, consisting of multiple routines for word processing (Microsoft Word, WordPerfect), spreadsheets (Lotus 1-2-3, Microsoft Excel), desktop publishing (Aldus PageMaker), and graphics rendering (Pixar Typestry). We normalize each individual test result against the slowest performer on the test in question; we then weight these preliminary results and compute a harmonic mean for each category.

WORKSTATION LABS TESTS

Dhrystone



Graphstone

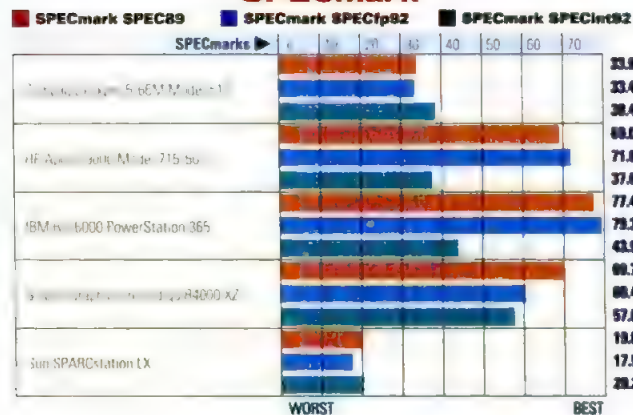


* Using the GL library. The X11 library score was 57,699

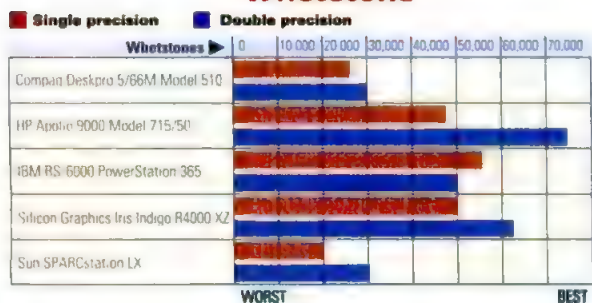
Khornerstone



SPECmark



Whetstone

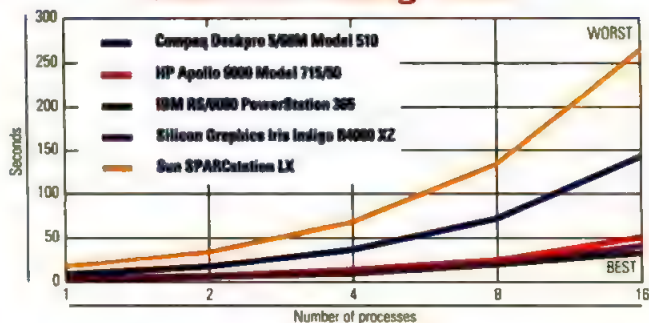


X11PERF

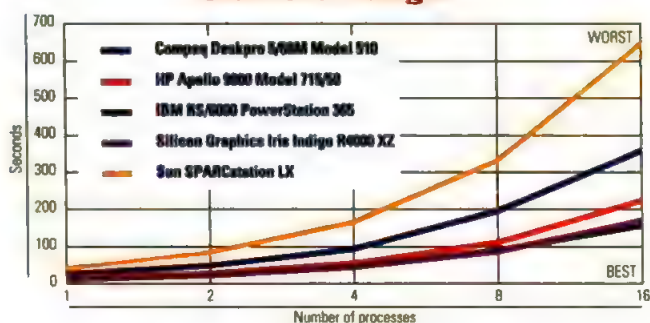


PC MAGAZINE LABS TESTS

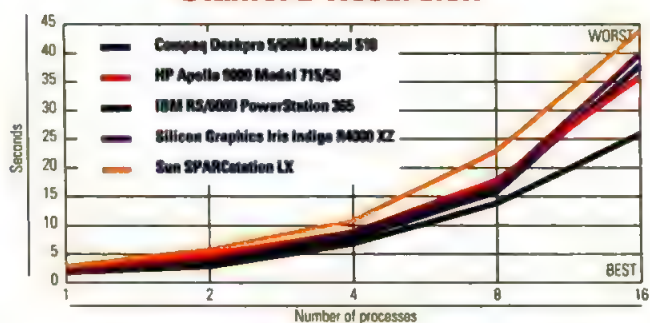
Stanford Floating-Point



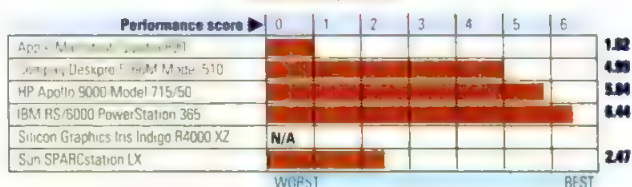
Stanford Integer



Stanford Recursion

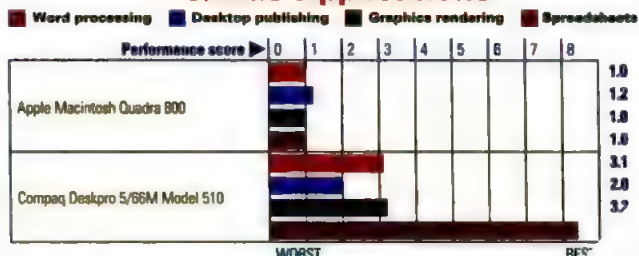


AutoCAD



N/A—Not applicable. AutoCAD does not run on this unit.

PC/Mac Applications



ent in an NFS-based Sun Ethernet server network. Otherwise, the LX was too underpowered and quirky to be of good utility for the tasks we rated. Note, however, that Sun's line includes several other high-performance machines.

The Quadra 800 also disappointed us, because we expected its raw performance to be better. Although the Finder is the best GUI of any we tested, and System 7.1 is a distinct cut above DOS 6.0/Windows 3.1, the Quadra 800 ought to be faster overall. As Windows 3.1 matures into Windows NT and Microsoft starts to improve the GUI further, the Apple Finder advantage won't be as significant. Of course, the primary reason Apple is moving its entire Macintosh line onto the PowerPC RISC CPU is that the company has nearly exhausted the performance potential of the Motorola 680X0 processor.

Still, given that companies like Radius (Rocket board) and DayStar (Power-Cache), sell faster 68040 CPU add-on coprocessor boards, you have to wonder why Apple can't squeeze more performance out of the Quadra 800. Perhaps the Macintosh Cyclones, which should be available this summer with their hot digital-signal coprocessors, will finally extract all the performance that a 68040 can offer in a Mac.

HOW SHOULD YOU CHOOSE?

Whew! How do you sort through all those test results and task ratings and make a choice? The first thing you must decide is whether or not you are willing to leave the comfortable environs of the DOS and Windows worlds. If not, then don't even consider a Macintosh or Unix box. Performance aside, the quality of your interaction with your computer is the most important issue, and only you can decide which system works best for you.

The basic truth, after all this testing, is that most PC users won't buy Unix systems for the simple reason that none of them is as good as a PC at providing sta-

ble, reliable, cost-efficient productivity applications. That fact hasn't changed over the last year, although all the Unix systems we tested are doing a much better job of attracting productivity software vendors to their platforms and their versions of Unix.

If the trend continues, by 1994 you may very well see the major Unix workstation vendors offering most of the pro-

ductivity programs you take for granted on your PC. Of course, they will still be providing them on an underlying Unix operating system, which will put off (or frighten) many PC folk. More difficult will be choosing among the Windows NT solutions that run on Intel and RISC processors.

A big choice for many PC people won't be between buying a faster PC (like our Pentium-based Deskpro 5/66M) and a Windows NT/RISC plat-

form or Unix workstation, but between buying a faster PC and a high-end Macintosh (including the PowerPC). As you can see from our performance test and task scoring, the Quadra 800 still asks you to pay a considerable price for its excellent System 7.1 and Finder GUI.

Still, any PC owners who are contemplating bigger, faster machines than the old war-horses currently on their desks should check in with their neighborhood Apple dealers to find out what the hullabaloo is all about. There are some PC users who will want to take a very serious look at Unix workstations, Macintoshes, and even Pentium-based PCs running Unix. Why? Unix offers considerable connectivity prowess and access to some scientific, rendering, engineering, and CAD software that will never live properly on DOS or even Windows NT. And the Quadra 800 offers an alternative and brilliantly smooth GUI, and a growth path to workstation operating systems with its upcoming PowerPCs.

If you plan to run specific categories of software (scientific, 3-D modeling, and so on), and you need the best performance available, then look closely at the

top three Unix workstations we tested—the HP Apollo 9000, the PowerStation 365, and the Indigo XZ. If you think that you must have a standalone SPARCstation, you will probably want to consider a more expensive and higher-powered model than the SPARCstation LX we tested (which just couldn't match its higher-priced competitors).

A SUMMATION

The Pentium chip (used in our test Compaq machine) really is a speed and performance breakthrough for PCs. It has enough horsepower to blow away a similarly configured Macintosh, and to play in the same league as midlevel Unix workstations when running SCO Unix (it will be interesting to test Sun's Intel Solaris and NeXT's 486 NeXTStep on a Pentium-based PC to see if this holds up for other Unix variants).

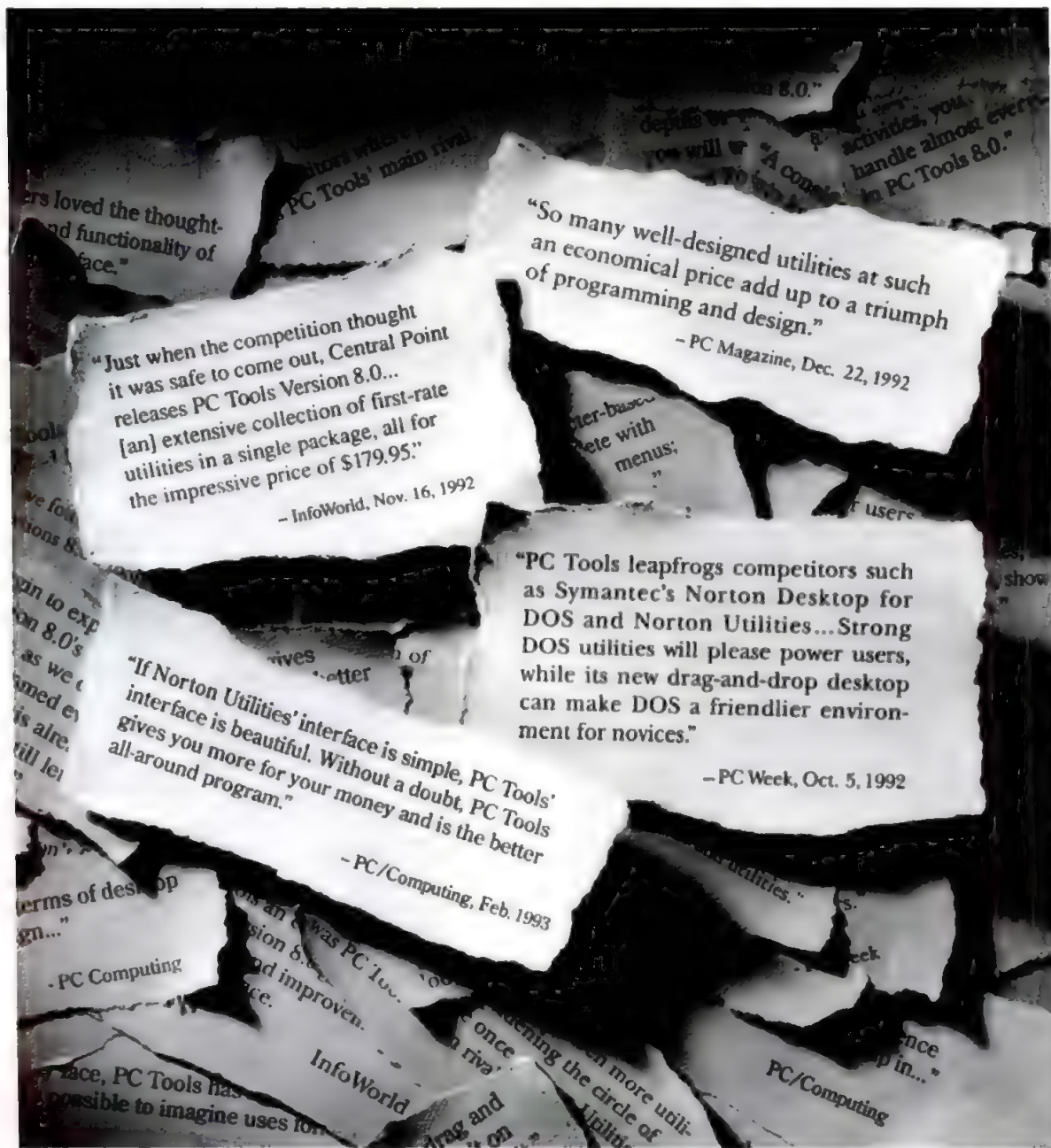
However, while our test Deskpro 5/66M beat up the Quadra 800 at rendering, its low-level performance tests against the Unix competition show that it still lags behind the midrange workstations in many performance areas. While the Pentium-based PC is at least on the same playing field, you shouldn't buy one thinking that it will provide you with the same kind of performance that a workstation like the HP Apollo 9000, PowerStation 365, or Indigo XZ can crank out.

While the SPECfp92 performance of the Deskpro 5/66M was three times better than the 486DX2/66 we tested last year, it was still less than half as fast as the HP Apollo 9000 and PowerStation 365 and about half as fast as the Indigo XZ. Unix workstations still have serious performance advantages for both integer- and floating-point-based applications, as well as graphics rendering.

That is really our bottom line. If you plan to stick with the productivity/application mix that you currently have, then upgrading to a Pentium-based PC, on which you will eventually run Windows NT, probably makes the most sense. However, if you need high performance for engineering, 3-D graphics, and networked applications development (especially networked databases that use SQL), then Unix workstations deserve a long look.

*Of the Unix
workstations we
tested, our
favorite was the
HP Apollo 9000,
an excellent
machine for
engineering tasks.*

We think PC Tools 8.0 will impress you.
Of course, you could get an 82nd opinion.



PC Tools™ Version 8.0 is a trademark of Central Point Software, Inc. Names of other companies' products are used for identification purposes only. © 1993 Central Point Software, Inc.

There's only one thing missing from Central Point

Software's new PC Tools™ 8.0. A bad review. And now

PC Tools 8.0 is totally compatible with DOS 6.0.



Copyright 1993

Pick up a copy at your local dealer, or call us now

and ask us about our special upgrade package. Try

it out. We could always use another great review.

Central Point Software[®]

1-800-289-6448 Ext. 23

CIRCLE 079 ON READER SERVICE CARD

Compaq Computer Corp.

Compaq Deskpro 5/66M Model 510

BY DON CRABB

Nearly a year ago, we were raving about 50-MHz 486DX systems. Then just a few months later we rolled out the bandwagon for 50-MHz 486DX2s. And then early this year, we ballyhooed 66-MHz 486DX2s. Are we fickle, or has the performance treadmill for PCs become so fast that new machines seem to spin wildly off it into space?

Well, we suspect a little of both. The simple truth is that every new Intel x86 processor upgrade has created an entirely new and faster generation of DOS-based PCs. Now with the 586—oops! we mean the Pentium—Intel has raised the performance bar even higher.

For testing, we chose to use a hot new Compaq Deskpro 5/66M powered by Intel's Pentium CPU. It was equipped with an ATI Graphics Ultra Plus board for tests involving 24-bit images and a QVision 1024/E card for other testing. We tested the Deskpro 5/66M with DOS 5.0, Microsoft Windows 3.1, and Version 4.0 of SCO Unix 3.2 so that we could compare its raw performance to Unix workstations running Workstations Labs' (WSL) low-level benchmark tests.

The Deskpro 5/66M was chosen as a representative PC platform because its Pentium processor enables it to compete with midrange workstations on a number of tasks and because Compaq systems have become good values over the last year. Although our test platform was not formally priced at press time, Compaq reported it would list for about \$7,500 to \$8,000.

Besides the 66-MHz Intel Pentium CPU, our configuration included 32MB of RAM, a 20-inch color monitor, a QVision 1024/E card, a 510MB hard disk

drive, DOS 5.0, and Microsoft Windows 3.1. For SCO Unix 3.2, Version 4.0, you must pay an additional \$1,495. The FORTRAN compilers that WSL used during testing are \$995. All tests were run fully optimized for an Intel 486, which was the best that WSL could do with the current version of SCO Unix (which is not yet Pentium-specific).

PC PREDOMINATES

Among the different workstations tested, the Pentium-packed Deskpro 5/66M provided the most solid price/performance ratio. With the addition of the SCO Unix operating system, the Deskpro 5/66M beat the Sun SPARCstation LX and acquitted itself well on most of the other low-level tests. None of the tested workstations beat it at performing general business applications, and none showed more overall value.

The Deskpro 5/66M ran the Rayshade graphics test two to three times as fast as the SPARCstation LX, had equivalent Khronerstone scores (because of its slower hard disk), and ran most of the floating-point tests faster. That's excellent performance for a PC that is not optimized to run Unix (as the workstations are). The only category in which the Deskpro 5/66M's performance was mediocre was in two-dimensional and three-dimensional graphics processing.

Today's fastest PCs (including the Deskpro 5/66M) run as much as 50 times as fast as an original IBM PC or XT, and 20 times as fast as a 286-based AT-class PC. Compared with a slower PC that WSL tested (a Mobius 486DX running at 50 MHz), the Deskpro 5/66M ran the low-level tests from half as fast to four times as fast.

The Deskpro 5/66M's excellent hard disk performance was much better than



The Compaq Deskpro 5/66M is powered by Intel's brand-new 66-MHz Pentium chip, which makes the PC a challenger to RISC-based workstations.

the Mobius's, which is surprising considering that the Mobius has a fast SCSI bus (the Deskpro 5/66M uses a theoretically slower IDE drive). The Deskpro 5/66M also was as much as three times as fast as the Mobius at floating-point unit-intensive applications.

Based on WSL's tests and our own use, it's pretty clear that the Deskpro 5/66M's disk I/O problems stemmed from SCO Unix's ineffective use of disk buffers. This would not be a problem when running the machine under DOS or Windows NT, though, and if necessary you can always specify a faster hard disk, or you can opt for an optional SCSI interface.

PC SOFTWARE ADVANTAGE

The Deskpro 5/66M's software advantage comes from the impressive quantity and quality of programs on the market. You should not buy a midrange Unix workstation simply for running word processing or spreadsheet packages. PCs will continue to have access to a broad and deep supply of software, including multiple productivity applications. High-quality graphics software used to appear for Apple machines 18 to 24 months before it appeared for PCs. Because of the success of Windows, you now see nearly simultaneous Macintosh and Windows software releases. With the advent of Windows NT and better PC graphics cards, PCs will conceivably see graphics releases before Macs do (the PowerPC will confuse this issue, however).

When it comes to custom or turnkey

SUITABILITY TO TASK				
Compaq Deskpro 5/66M Model 510				
	POOR	FAIR	GOOD	EXCELLENT
Applications development	●	●	●	●
Connectivity	●	●	●	○
Engineering/scientific/ 2-D CAD	●	●	●	○
Desktop publishing	●	●	●	○
3-D graphics	●	●	○	○
Office productivity	●	●	●	●

NORTON ANTIVIRUS NOW PROVIDES SEVERAL LINES OF DEFENSE.



As long as PC viruses exist, Peter Norton will keep up the fight.

In the battle against PC viruses, it's not enough to be tough and comprehensive. With three new viruses coming out each day, you need flexibility, too.

A quality lacking in most antivirus software.

Until now. Because the Norton AntiVirus 2.1

for Windows and DOS delivers more than just the most powerful virus protection available today. It also provides a full range of instant Virus Update Services designed to defend your data far into the future.

MAIN LINE.



The Norton AntiVirus 2.1, your main line of defense, seeks out and destroys

more than 1,400 viruses – before they damage your system. It also detects file activity that signifies unknown viruses, like the new Mutation Engine, and removes them quickly and safely.

When it comes to networks, the Norton AntiVirus 2.1 is the only product that keeps an entire site up-to-date automatically. Our unique installation program updates virus protection on all your PCs in one easy step. And it supports all popular networks.

ON LINE.



But we don't stop there. With Norton AntiVirus, you can dial up our 24-hour on-line bulletin board or CompuServe for an instant update on the latest virus definitions. Or get updates mailed to you on disk with our SAV-U subscription program.

FAX LINE.

Our 24-hour Virus Faxline provides information and late-breaking news on the latest viruses, along with advice on



instant protection against them. Plus tips for safe, virus-free computing.

PHONE LINE.



Our 24-hour Virus Newsline gives you recorded updates of the

latest virus news. Or call our free Technical Support for assistance with technical problems or virus outbreaks.

The goal of most virus hackers is to interrupt your work, if not destroy it.

Don't let them win. Start protecting yourself with the only software package that stops new viruses as fast as they can make them – Norton AntiVirus 2.1. You can pick it up for just \$129* from your local dealer. Or if you'd like complete specs, please phone **1-800-554-4403** (enter 710) for an instant FAX Data Sheet.



**THE NORTON
ANTIVIRUS™
SYMANTEC™**

FACT FILE

Compaq Deskpro 5/66M Model 510

Compaq Computer Corp., P.O. Box 692000,
Houston, TX 77269-2000; 800-345-1518,
713-370-0670

Estimated price (tested configuration): From
\$7,500 to \$8,000

Motherboard and CPU: Compaq Pentium board, 66
MHz; 32MB RAM; 256K direct-mapped external pro-
cessor cache.

Storage: 510MB Conner IDE hard disk, 3.5-inch
1.44MB floppy disk drive.

Display: 1,280-by-1,024; 2MB VRAM; 20-inch monitor.

Graphics adapter: QVision 1024/E; ATI Graphics Ultra
Plus (\$499)

Software: DOS 5.0, Microsoft Windows 3.1, SCO Open
Desktop Development System, Version 2.0.0 (\$1,795)
SCO Open Desktop Personal System (\$1,495)
Microway NDP Fortran-486 4.1c (\$995), switches used
-n2 -OLM. C Compiler (included with Open Desktop),
switches used -O. Graphics library X11.

In short: The Pentium CPU pushes the PC into a per-
formance domain formerly associated with Unix work-
stations. While Pentium-based systems still can't beat
midrange Unix workstations at engineering and graph-
ics applications, Pentium promises to force workstation
manufacturers to boost their RISC performance.



ON READER SERVICE CARD

applications, the PC is far ahead of the other test machines (the Mac comes in second). Clever vertical-market programs such as cattle-management software or specialized databases are much more likely to appear in DOS versions than in software for Macs or Unix workstations.

CONNECTIVITY

When it came to connecting the Deskpro 5/66M to other machines, we found that the simplest connection was to another PC, although Unix workstations and Macs offer some excellent connectivity options. The PC offers users many networking choices, ranging from peer-to-peer networks to server-based networks running Novell's NetWare, Banyan's VINES, or Microsoft's LAN Manager—on Ethernet or Token-Ring. This range of choices is easily as broad the range available for any other platform. Networking is not an integrated capability of

PCs, however, as it is on the other platforms tested. This is changing with the advent of PC shrink-wrapped LANs (that is, file servers with preinstalled network operating systems, network cards for the server and PCs, and cabling). Moreover, by buying everything from one source, you get single-vendor accountability.

Apple Computer, Sun Microsystems, Hewlett-Packard Co., IBM Corp., and Silicon Graphics already build various levels of network support into their respective operating systems. Now Microsoft has done the same with Windows for Workgroups, which will eventually become part of Windows NT. This will put PC networking operating systems on a reasonably level playing field with the likes of System 7.x and Unix.

SUITABILITY SUITE

As with the other machines here, we rated the Deskpro 5/66M for its suitability to six different tasks: applications development; connectivity; engineering, scientific, and 2-D CAD; desktop publishing; 3-D graphics; and office productivity. The Deskpro 5/66M excelled at office productivity and applications development (thanks again to the surfeit of excellent development systems for DOS and Windows). It garnered a 3 rating for connectivity; while there are ample and highly functional network solutions, networking is not an integrated capability.

CONCLUSIONS

The bottom line is that Pentium processors push the PC platforms into performance domains formerly associated with Unix workstations. While they still cannot beat midrange Unix workstations at engineering and graphics applications, Pentium-based PCs promise to make workstation manufacturers boost their RISC processors' performance in order to maintain the price/performance ratios for the tasks at which their workstations excel. Because of its fast CPU, a Pentium-equipped Deskpro 5/66M can do a good job running engineering or desktop publishing applications available either under DOS

5.0, Windows 3.1, or SCO Unix.

A Compaq (indeed, any Pentium-based PC) would be a formidable challenger to most low-end and midrange Unix workstations (in the \$11,000 range) if you tossed in a SCSI-2 hard disk drive and a better version of PC Unix. It could take on the higher-priced machines (like the HP, IBM, and Silicon Graphics offerings tested here) with a faster, high-resolution graphics card, sure to hit the PC market later this year.

Apple Computer

Apple Macintosh Quadra 800

BY BERNARD J. DAVID

The Apple Macintosh has traditionally defined ease of use in desktop computing. With its operating system design, mouse-driven graphical user interface, and ability to connect to peripherals and other computers in a simple plug-and-play manner, the Mac reflects Apple's mission to keep the user—rather than the programmer—in mind as its primary stakeholder.

Today, all Macs ship ready to use out of the box with System 7.1, an Apple SuperDrive floppy disk drive (which reads Mac, DOS, Microsoft Windows, OS/2, and ProDOS disks), and built-in networking, sound, and video capabili-



Apple's high-end Quadra 800 excels at graphical applications and desktop publishing. The System 7.1 operating system and user interface make the Quadra easy to use and configure.

ties. Apple machines are based on Motorola 680x0 processors, although the future Mac operating system will probably use the PowerPC chip being developed by Apple, IBM Corp., and Motorola.

Mission



IBM Programming Systems introduces
C Set ++™, the most complete application
development package you can buy for

OS/2®. Its 32-bit C/C++

compiler lets you unleash
all the power of OS/2—so you can
create the most advanced, high-
performance applications.

It has an extraordinary code optimizer with a
full set of options. Even a switch to optimize the new
Pentium™ processor. Plus a full set of class libraries,
including application frameworks for PM, container
classes and classes for multitasking, streams and more.

There's also a full complement of other helpful
features. Such as an interactive source level debugger.



C Set ++

And the unique Execution Trace
Analyzer traces the
execution of a program,
then graphically displays
diagrams of the
analysis. Plus a class
library browser that

shows class library relationships.

What's more, you get Workframe/2™, a language-
independent tool that lets you customize your own envi-
ronment. It's adaptable and flexible—you can use any 16
and 32-bit DOS, Windows™ and OS/2 tools.



You can upgrade from any C/C++ DOS, Windows or
OS/2 compiler for only \$175* until August 30, 1993.

To order C Set ++ at the low price of only \$525, or to
get an information kit, call 1 800 342-6672 (USA) or
1 800 465-7999 (Canada).

Clearly, there's only one place to start. C Set ++.

critical code

C Set ++ Technical Features

Standards	ANSI C X3.159-1989
	NIST validated
	ANSI C++ X3J16 (Full ARM)
	ISO 9899:1990
Optimization	Global
	Inter-module
	Function inlining
	Instruction scheduling

starts here.



*WorkSet/2 upgrade only \$149. IBM and OS/2 are registered trademarks and C Set ++ and Workframe/2 are trademarks of International Business Machines Corporation. Pentium is a trademark of Intel Corporation. Windows is a trademark of Microsoft Corp. © 1993 IBM Corp.

The Apple line includes desktop, compact, and portable machines, and the company just introduced its first dedicated servers. The recently redefined desktop series includes the low-cost Macintosh LCII (68030, 16 MHz) and Macintosh LCIII (68030 with a 32-bit data bus, 25 MHz). The Macintosh IIvx (68030, 32MHz), the Centris 610 (68040, 20MHz), and the Centris 650 (68040, 25 MHz) round out the moderately priced desktop Macs. The Quadra 950 (68040, 33 MHz) is Apple's only tower computer and the most powerful of the line. Transportables include the Macintosh Classic II (68030, 16 MHz) and the first color transportable, the Macintosh Color Classic (68030, 16 MHz).

We tested the Apple Macintosh Quadra 800, the most powerful of the desktop Macs, which features a 33-MHz Motorola 68040 chip and 32-bit data bus. The Quadra 800 can accept up to 136MB of RAM (using 8MB single in-line memory modules), while the Quadra 950 can only expand to 64MB. Priced at \$8,690, our test machine included a 33-MHz 68040, 24MB of RAM, a 500MB hard disk drive, a 16-inch color monitor, built-in Ethernet, and a SCSI interface.

We pitted the Quadra 800 against the Compaq Deskpro 5/66M Model 510, each running its most popular operating system (System 7.1 and DOS 5.0/Windows 3.1, respectively), in a series of application tests, which involved word processing, spreadsheets, desktop publishing, and image rendering. As our tables show, the Quadra 800's processing power paled in comparison with the Pentium-powered Deskpro 5/66M's. Its performance was strongest in desktop publishing. Its suitability-to-task scores were high for connectivity, three-dimensional graphics, and office productivity.

The computer industry is a game of leapfrogging technologies. While DOS-based PCs have gained a power advantage with the new Pentium chip (which compares with the Mac's aging Motorola

680x0 line), Apple's system software remains superior (in terms of elegance of design, functionality, and ease of use) to DOS/Windows software. Apple aims to match Pentium's power with systems that are based on the Apple/IBM/Motorola

PowerPC chips. Windows NT is Microsoft's attempt to surpass Apple's System 7.1 (NT is multitasking, multithreaded).

The test results reflect the Mac's strength among its installed base. The Mac's strongest sales traditionally have been in the

desktop publishing, education, graphics, and home markets. Graphical software has particularly distinguished the Mac and made it popular among its users.

The amount of third-party software packages available for the Apple and PC platforms is about equal. Thousands of applications are available for the Mac, including programs from Microsoft, the largest producer of Mac software.

Apple takes great pains to ensure that its computer designs make sense to people who use them. This is one reason why its PowerBook, which has won several recent design awards, is selling so well. Apple insists that applications adhere to its Human Interface Guidelines, a set of rigid standards for applications' look and feel. This gives users a consistent, easy-to-learn operating environment. Apple's ease of use extends to the addition of expansion cards, printers, and other peripherals, which are truly plug-and-play. The system software recognizes and automatically configures the attached device.

System 7.1 contains code for generalized functions that applications can use, which enables Mac programs to be smaller than their DOS, Windows, and OS/2 counterparts. Microsoft Word for Windows, fully loaded, requires 15MB of hard disk space and 4MB of RAM on Windows, while Word for Mac occupies only 6.7MB of disk space. Application programs can use the object oriented-type extensions to perform tasks such as printing and communicating.

The Mac sports two operating systems: System 7.1, which is the native Mac operating system, and A/UX, Version 3.0, which is a version of Unix. Very few Apple users, however, run A/UX on their Macs. System 7.1 provides built-in extensions (such as QuickDraw) that let users and developers take advantage of functionality that is a part of every Mac. Apple continues to extend this functionality, most recently with its QuickTime multimedia software that lets users work with video, sound, and animation.

System 7.1 also lets applications take advantage of Publish and Subscribe, a feature that links information between documents and applications, as well as across networks, to perform automatic information updates. This is similar to Windows' OLE (Object Linking and Embedding) and DDE (Dynamic Data Exchange) capabilities.

Mac graphics capabilities let up to 16 million colors be displayed using the 32-

SUITABILITY TO TASK				
Apple Macintosh Quadra 800				
Applications development	●	●	○	○
Connectivity	●	●	●	○
Engineering/scientific/ 2-D CAD	●	●	○	○
Desktop publishing	●	●	●	●
3-D graphics	●	●	●	○
Office productivity	●	●	●	○

FACT FILE

Apple Macintosh Quadra 800

Apple Computer, 20525 Mariani Ave.,
Cupertino, CA 95014;
800-776-2333, 408-996-1010

List price (tested configuration): \$8,690

Motherboard and CPU: Motorola 68040, 33 MHz; 24MB RAM, 8K internal cache (4K data, 4K instruction)

Storage: 500MB hard disk, CD-ROM drive, 1.2MB floppy disk drive

Keyboard: Ergonomic keyboard, mouse, and extended keyboard

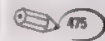
Display: 832-by-624, 1MB VRAM, 16-inch color monitor

Graphics controller: MEMC integrated graphics controller.

Network adapter: Ethernet, Apple LocalTalk

Software: System 7.1

In short: Of the various systems we tested, the user interface of the Apple Macintosh Quadra 800 is certainly the best of the bunch. The Mac traditionally has defined ease of use in desktop computing, but the Mac is out of its league when it comes to performance. The results of our application tests show that the Pentium-based PC has lapped its Mac competition—even in domains that were thought to belong solely to the Mac. On some Mac-vs.-PC graphics tests, the PC was an order of magnitude faster.



FOR \$2499, DRIVE THE NEW GRiD® CONVERTIBLE.™

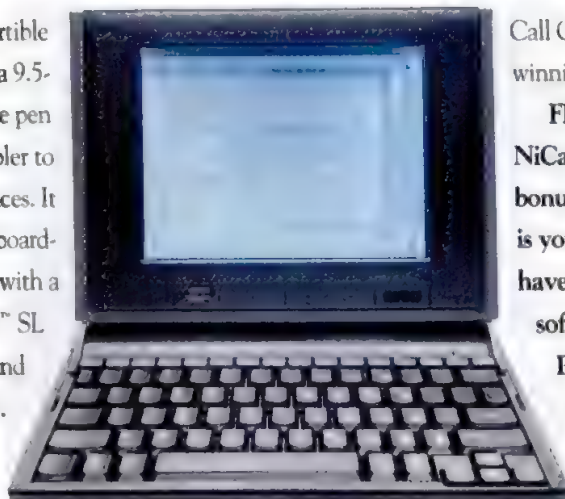
The Convertible travels easily – with the top down, it's a pen computer. Use the pen sitting or standing for data input and pen-based applications. The Convertible can store your handwritten input as either ink or text. And unlike most mobile computers, the Convertible



has a rugged magnesium case that's both lightweight and durable. Includes MS DOS 6.0,™ Windows™ for Pen Computing and a version of PenCell®, a spreadsheet uniquely designed for the pen and compatible with common desktop spreadsheets.

WITH THE TOP DOWN.

Flip the top up, and the Convertible becomes a versatile notebook with a 9.5-inch screen and full-sized keyboard. The pen serves as a pointing device, much simpler to use than a mouse or trackball it replaces. It runs Windows and traditional keyboard-based MS-DOS™ programs, and comes with a 125 megabyte hard drive, an Intel 386™ SL microprocessor, a math coprocessor and 4MB RAM, upgradable to 8MB RAM. Includes PCMCIA Version 2 slot for network and wireless connectivity.



Call GRiD DiRECT and order the award-winning GRiD Convertible today!

FREE! Order now and receive an extra NiCad battery at no cost. And, as an added bonus, GRiD Pen Essentials – a \$700 value, is yours for only \$349. You may never have to use paper again with this great software package including Day-Timer® Pen Scheduler, Slate LooseLeaf™ Notetaker, Delrina WinFax™ Pen Software, spare pen and batteries, custom carrying case and more.

WITH THE TOP UP.

GRiD® DiRECT

800-934-GRiD



Includes a reduced feature set working model of PenCell®, for a limited time. GRiD is a registered trademark of GRiD Systems Corporation. GRiD Convertible, and GRiD DiRECT are trademarks of GRiD Systems Corporation. MS-DOS and Windows are trademarks of Microsoft Corporation. All other trademark and trade names are held by their respective owners and should be treated as such. Warranty: 1 year carry-in or mail-in to any authorized service center. 30-day money back guarantee and lifetime technical support Monday-Friday from 8 a.m. to 6 p.m. CST. BUILT IN THE USA.

CIRCLE 342 ON READER SERVICE CARD



KELLY FALLON
RESEARCH ANALYST
FIRST USED IMPROV 2/3/93

SURE, ANY SPREADSHEET CAN DO THE A,B,C's.

IMPROV HAS MASTERED ENGLISH.

IMPROV® FROM LOTUS® DOESN'T WORK THE WAY YOU EXPECT. INSTEAD, IT ACTUALLY WORKS THE WAY YOU THINK. IN PLAIN ENGLISH.

NO MORE TRANSLATING BUSINESS MODELS INTO CRYPTIC LITTLE FORMULAS. NO MORE CELL ADDRESSES LIKE "B23" AND "C10." BECAUSE THE IMPROV SPREADSHEET IS DIVIDED INTO CATEGORIES AND ITEMS LIKE "QUARTER 4" AND "REVENUE."

SO IF YOU WANT TO ENTER A FORMULA TO CALCULATE GROSS MARGIN YOU JUST TYPE IN "GROSS MARGIN=REVENUE-COST OF GOODS" OR POINT AND CLICK ON THOSE ITEMS AND CATEGORIES.

BUT THE ENGLISH LANGUAGE FORMULAS DO A LOT MORE THAN MAKE IMPROV MORE NATURAL TO WORK WITH. SINCE THEY'RE NOT CELL ADDRESS-BASED (B5+C6-D5), THEY CAN EASILY BE APPLIED TO MANY CELLS AT ONCE. WHICH MAKES IT EASIER TO EXPAND YOUR MODEL AND HARDER TO MAKE ERRORS, WHEN MANIPULATING YOUR WORKSHEET.

AND WITH ALL LABELS AND FORMULAS EXPRESSED IN ENGLISH, THE SPREADSHEET IS TOTALLY SELF-DOCUMENTING. SO ANYONE CAN TURN TO IT AT ANY TIME AND UNDERSTAND THE LOGIC BEHIND IT.

ALL OF WHICH STILL CAN'T UPSTAGE THE NEWS THAT IMPROV IS THE WORLD'S FIRST DYNAMIC SPREADSHEET. AND THAT WILL LITERALLY CHANGE THE WAY YOU LOOK AT SPREADSHEETS.

WITH ITS DYNAMIC VIEWS, IMPROV LETS YOU ROTATE, HIDE, SHOW, COLLAPSE, SLICE, DICE AND EXPAND WORKSHEETS IN WAYS NO TRADITIONAL SPREADSHEET CAN. SO RATHER THAN SPENDING

	Revenue	Cost of Goods	Gross Margin	Expenses	Total	Net Revenue
This Year	9,626	5,294.30	4,332	1,403	2,929	
Next Year	11,551	6,153.15	5,398	1,684	3,714	
This Year	3,244	1,784.70	1,460	592	868	
Next Year	3,893	2,117.04	1,776	730	1,046	
This Year	3,772	2,074.60	1,697			
Next Year	4,526	2,489.52	2,036			

LOOK, EVERYTHING IS IN ENGLISH. YOU'VE JUST SEEN IT AND ALREADY YOU CAN UNDERSTAND THIS SPREADSHEET

HOURS RECONSTRUCTING WORKSHEETS TO GAIN NEW PERSPECTIVES, YOU JUST DRAG AND

DROP A CATEGORY TILE WITH YOUR MOUSE. THE NEW VIEW IS CREATED ON THE SPOT.

WITH IMPROV, LOTUS TAKES THE WINDOWS™ PLATFORM BEYOND THE VISION OF ANY OTHER SOFTWARE DEVELOPER.

TO PUT IT IN PLAIN ENGLISH, INFOWORLD SAID "SERIOUS SPREADSHEET USERS...OWE IT TO THEMSELVES TO GET A COPY OF THIS \$495 PACKAGE."! ESPECIALLY SINCE, FOR A VERY

LIMITED TIME, IMPROV FOR WINDOWS IS ACTUALLY AVAILABLE AT AN INTRODUCTORY PRICE OF

JUST \$99! HOWEVER, ON JUNE 1, 1993, THE PRICE DOES RETURN TO \$495!

TO ORDER, CALL US DIRECT AT 1-800-872-3387, EXT. 8768, OR VISIT YOUR LOCAL LOTUS AUTHORIZED RESELLER.

SPECIAL
INTRODUCTORY
OFFER.
REGULAR
PRICE
\$495.



Lotus

Introducing Improv

THE FIRST DYNAMIC SPREADSHEET FOR WINDOWS

■ Comparing CPU Architectures

The PC paradigm will shift as vendors pack new processors into PC boxes

by Nick Stam and Daniel Tabak

A large number of new and very fast processors will start appearing in personal computing systems in the next few years. CISC (complex instruction-set computing) processors from Intel and Motorola have dominated PC designs to date, and RISC (reduced instruction-set computing) processors have been prevalent in workstation-class systems.

The distinction between personal computers and workstations will become less apparent as RISC-based systems start supporting the existing base of popular Microsoft Windows and DOS applications (and future Windows NT applications) by using Windows NT. In fact, Intel's new CISC-based Pentium processor may be challenged by architecturally superior RISC chips that run NT. A number of RISC makers, including Digital Equipment Corp. and MIPS, are currently working with Microsoft to port the NT system to their designs.

RISC VS. CISC

The subject of debate since the mid-seventies has been which architecture is better, RISC or CISC. RISC processors provide a streamlined handling of instructions and include a simple instruction set. CISC processors use a more complex set of instructions.

RISC chips usually contain fewer than 128 instructions, compared with 200 to 300 in typical CISC chips. RISC chips provide far fewer instruction formats and addressing modes than CISC chips, resulting in simpler on-chip control hardware.

CISC instruction-set complexity yields slower internal operation and takes up added chip real estate for instruction decoding and control logic that could be used for other performance-optimizing features, such as larger cache sizes or more registers. The fixed length of RISC instructions (gen-

erally 32-bit) yields better alignment of instructions in memory, resulting in more efficient fetch operations.

RISC instruction-set design allows RISC chips to implement multistage on-chip pipelines more efficiently than CISC processors. RISC processors provide an additional advantage over typical CISC chips by including many on-board registers to perform calculations. RISC processors use simpler instructions than CISC chips use, but RISC-based programs often require more instructions to accomplish a task.

CISC WARS: INTEL VS. MOTOROLA

The most widely used CISC microprocessor families are Intel 80x86 and Motorola 680x0. Intel and compatible microprocessors (AMD, Cyrix, IBM, and TI) serve the PC marketplace, while Motorola chips are used in Apple Macintoshes. The most popular high-end PC and Mac CPUs are the Intel 80486 and the Motorola 68040. Each is a 32-bit microprocessor with a floating-point unit, memory-management unit, and 8K cache all included on-chip.

While the 80486 internal cache is unified (instruction and data caches combined), the 68040 features a dual cache (4K instruction/4K data) and dual memory-management units. This gives the 68040 a definite performance advantage in its pipeline operations because accesses to instructions and data can occur simultaneously. The 80486 and 68040 both have 4-way set-associative caches with 16 bytes per cache line. However, Intel enjoys a current advantage: Its 486DX2 clock-doubled chip can run at 66 MHz, while the fastest 68040 runs at 33 MHz (as seen in the new Apple Macintosh Quadra 800). Although the 68040 has architectural advantages, at the moment its performance is eclipsed by the 80486's higher clock rates.

The Pentium brings significant architectural changes to Intel's standard CISC designs. Although still a 32-bit internal design (32-bit registers, 32-bit integer operations, and a 32-bit address bus), the Pentium includes many advanced features seen in RISC processors. Its dual internal cache (8K instruction/8K data), 64-bit data bus, 66-MHz operation, improved floating-point unit, and superscalar design distance it even further from the 68040.

NEW RISC CHIPS

Alpha. In 1992, Digital Equipment Corp. unveiled its long-awaited Alpha chip. Digital is banking a good part of its future on Alpha's success and is planning for a 25-year architectural life span. Alpha supports OSF/1, VMS, and Windows NT. The fastest Alpha chip has an incredible 200-MHz clock rate and uses 1.68 million transistors. Digital achieves such high clock rates in part by using Digital's 0.75-micron CMOS-4 technology and 3.3-volt operation.

Alpha is a true 64-bit dual-issue superscalar and superpipelined design with seven integer pipeline stages, and it uses both an 8K instruction and 8K data cache. (Superpipelined chips usually have more pipeline stages than typical processors, allowing more instructions to be in various stages of execution; functional units on-chip, such as the Arithmetic Logic Unit (ALU), are often split into more than one pipeline stage.) Alpha's dual-issue capabilities are a bit restrictive, lacking the Pentium's ability to issue two integer operations in parallel. Alpha can dual-issue a floating-point and integer instruction, and a few other popular combinations of instructions.

MicroSPARC and SuperSPARC. Sun Microsystems and Texas Instruments have combined forces to manufacture

both the SuperSPARC and MicroSPARC RISC processors. The MicroSPARC, used in Sun's SPARCstation Classic and SPARCstation LX, is a 32-bit scalar (single-pipeline) processor designed for lower-cost workstations. The 800K-transistor chip integrates a dual cache (4K instruction/2K data), DRAM control, and bus interface logic. The MicroSPARC is implemented with a 0.8-micron CMOS process, runs on 5 volts, and consumes approximately 3.5 watts at 50-MHz operation. With its high integration and a static core (the CPU can be slowed down), the MicroSPARC may also be destined for use in laptop computers.

SuperSPARC is the first superscalar version of SPARC processor technology and specifically implements a three-issue superscalar design that operates at 40 MHz and is based on a 0.8-micron BiCMOS process. Still only a 32-bit processor, but with approximately 3 million transistors, the SuperSPARC has advanced superscalar features that can not only issue three instructions at once, but can handle data dependencies between instructions in its execution unit. Most superscalar processors would determine that dependencies exist, and resort to single issuance of the dependent instructions. Used in Sun's SPARCstation 10, the SuperSPARC has dual on-chip caches (20K instruction/16K data), and eight pipeline stages.

Hewlett-Packard Precision Architecture (PA/RISC) 7100. Hewlett-Packard's PA/RISC architecture has received much acclaim in the past year, particularly for its exceptional floating-point performance. The newest incarnation, called the 7100, is a 32-bit processor that runs at approximately 100 MHz and is implemented with a 0.8-micron CMOS process. Containing 850,000 transistors, the 7100 incorporates a floating-point unit on-chip, rather than the separate floating-point chips used in previous PA/RISC architectures.

Classically, PA/RISC designs have not incorporated cache on-chip, and the 7100 is no different. HP relies on fast

SRAM caches just outside the chip, accessed with a 64-bit data path. This allows system vendors to build larger or smaller processor caches depending on target markets; data cache can range from 4K to 2MB and the instruction cache ranges from 4K to 1MB. Similar to the Alpha, the 7100 is a dual-issue superscalar design with the restriction of not being able to issue two operational integer instructions at a time. HP currently includes 33-MHz, 50-MHz, and 99-MHz versions of the 7100 in many recently announced HP Apollo 9000 Model 715/50 workstations.

MIPS R4000 and R4400. Silicon Graphics acquired financially troubled MIPS Computer Systems in June of 1992 to ensure that MIPS chip technology would not flounder (all SGI workstations use MIPS RISC chips). The MIPS R4000 was the first true 64-bit microprocessor with 1.3 million transistors using a 1-micron CMOS design. The R4000 includes a dual cache (8K instruction/8K data), an on-board floating point, and a second-level cache control logic in higher-end versions.

The R4400 is basically a new, souped-up R4000 with larger internal caches (16K instruction/16K data) and faster clock rates. Using a 0.6-micron CMOS process, the R4400 contains 2.2 million transistors. Both chips are considered dual-issue superpipelined, with the ability to issue two instructions down their pipelines during each external clock cycle. Internally, the R4000 runs at 100 MHz—double its external 50-MHz clock input—so all pipeline operations are performed in half-clock timings with respect to the external clock. The R4400 uses a 75-MHz external clock and runs its pipeline at 150 MHz. For performance, *Microprocessor Report* rates high-end MIPS chips slightly behind HP PA/RISC and Alpha but slightly ahead of SPARC chips.

IBM RS/6000 and PowerPC. IBM introduced a whole line of RISC workstations in early 1990 based on their RS/6000 processor chip set. Not a single

CPU chip, the original RS/6000 processor design uses seven or nine separate chips, depending on configuration. With up to 7.4 million transistors, the RS/6000 implements an advanced superscalar design allowing up to four instructions to be simultaneously issued if conditions permit. Still short of high-end HP PA/RISC or Alpha performance, the RS/6000 delivers superb floating-point performance. Using four separate 16K data cache units and an 8K instruction cache in the maximum configuration, the RS/6000 is still a 32-bit design. IBM also provides a scaled-down single chip version of the RS/6000 called RSC (RIOS Single Chip).

The joint venture announced between Apple, IBM, and Motorola in late-1991 specified the joint development of single-chip versions of the RS/6000 processor architecture deemed the PowerPC. The PowerPC architecture will allow convergence of Apple's and IBM's product lines in terms of software support. Future Macintosh systems based on the PowerPC chip will be able to run RS/6000 software in addition to native 68000 binaries via emulation software. IBM PowerPC stations will run RS/6000 software in addition to existing MAC binaries. Pink, the next generation of object-oriented operating system being developed by IBM and Apple, will also run in PowerPC systems.

Using bus-interface technology from Motorola's own 88110 RISC processor and IBM's RSC core logic, the first PowerPC chip, called the "601," was formally announced in October, 1992. Implemented with a 0.6-micron CMOS process and housing 2.8 million transistors, the 32-bit 601 chip will run at either 50 MHz or 66 MHz. The PowerPC uses a 32K unified instruction/data cache, which is not the norm in RISC designs, but its eight-way set-associative configuration should improve hit rates. Superscalar techniques (three-issue maximum) are also carried over from the RS/6000 technology, and the 601 chip features 3.6-volt and 9-watt operation (at 50 MHz) for use in notebooks. □

bit QuickDraw technology. With an active-matrix portable or high-resolution monitor, the result is photographic-quality images for detailed renderings, simulations, and animations. QuickTime multimedia extensions take graphics a step further by letting users play movies on Macs, as well as cut, copy, and paste audio and video clips.

The Mac's built-in audio support also distinguishes it from a PC, allowing for voice input to word processing, spreadsheet, and presentation applications. Most PCs require add-in sound cards and software. Balloon Help, an interactive tool that lets users get information about an item by pointing to it on-screen, is also part of the operating system.

The Mac's Finder program can access files and folders anywhere on the Mac through a variety of search criteria. Finder also has a customizing feature that lets users organize their machines for instant access to files and applications. This feature, called aliasing, gives users access to an application in more than one place on the Mac.

The Quadra 800 comes with a built-in Ethernet port. And AppleTalk—the Mac networking protocol—is built into every Mac, which allows for use of network printers, file sharing with other Macs, and e-mail access. The Mac also has a built-in file-sharing capability that lets users share files and folders on the same network without a dedicated server. Files can be shared with Macs and PCs. Microsoft is providing peer-to-peer networking in its new Windows for Workgroups program, which most likely will be incorporated into Windows NT in the future.

Apple's Data Access Language (DAL) lets Mac users access remote databases through built-in extensions. Using DAL, users can extract information from minicomputers and mainframes transparently via the Mac interface. Microsoft's counter to DAL is ODBC (Open Database Connectivity).

CONCLUSIONS

Under Taligent, the Apple/IBM alliance, a new operating system based on object-oriented programming (called Pink) is being developed. Future Macs will be based on the PowerPC chip, an extension

of IBM's RS/6000 chip technology being built by Apple, Motorola, and IBM. PowerPC systems will run a future version of System 7.1 as well as Pink. It is unclear how the Apple and IBM product lines will evolve, but each company says it will have its own offerings.

Increasingly, Apple has focused on the corporate market, which is why it has introduced server solutions. Apple's alliance with IBM will help give the Mac greater connectivity (and legitimacy) within corporate environments.

Hewlett-Packard Co.

HP Apollo 9000 Model 715/50

BY DAVID WILSON

Performance is what sells workstations, and since the introduction of its HP Apollo 9000 Model 730 CRX system in early 1991, Hewlett-Packard has held the performance lead among desktop workstations and is one of the leaders in total workstation sales, trailing only Sun Microsystems. It is unusual for a company to hold a performance lead this long in the rapidly changing workstation market. The dominance of HP's Precision Architecture (PA)/RISC chips, however, is being challenged by Digital Equipment Corp.'s new Alpha processors, which boast clock speeds of up to 200 MHz.

The HP workstation line is geared toward compute-intensive scientific and engineering applications, where floating-point performance is critical. The model tested, Model 715/50, offers 13.2 MFlops of floating-point performance (which compares with the high-end Model 735's 40.8 MFlops), while a typical Intel 80486 33-MHz PC scores from 1 to 2 MFlops.

All machines in HP's 9000/700 series are based on HP's PA/RISC chips, of which there have been two implementations. The first PA processors had a separate CPU and FPU (floating-point unit). The more recent 710s, including the Model 715/50, have an integrated FPU. A broad range (in price and perfor-

mance) of HP machines are built from these chips.

The unit tested lands in the middle of HP's workstation line in terms of price and performance—placing it in the upper performance range among workstations in general. A Model 715/50 with a 1GB hard disk, 32MB of RAM, and a 19-inch color monitor is priced at \$17,240. It uses a 50-MHz 7100 processor chip and has a 64K instruction and data cache.

While the machine's configuration would be at the very high end of the PC spectrum, it is only a typical workstation system. HP's high-end desktop system is the Model 9000/735CRX, which is \$38,940 with a 19-inch color monitor, 32MB of RAM, and a 1GB hard disk.

The Model 715/50 is equipped with a standard EISA-bus slot, space for two 3.5-inch internal disks, and a removable media device. The machine comes with two RS-232 ports, a centronics parallel port, an external SCSI-2 port, an Ethernet LAN interface, and audio input/output. Each of the two internal disk bays

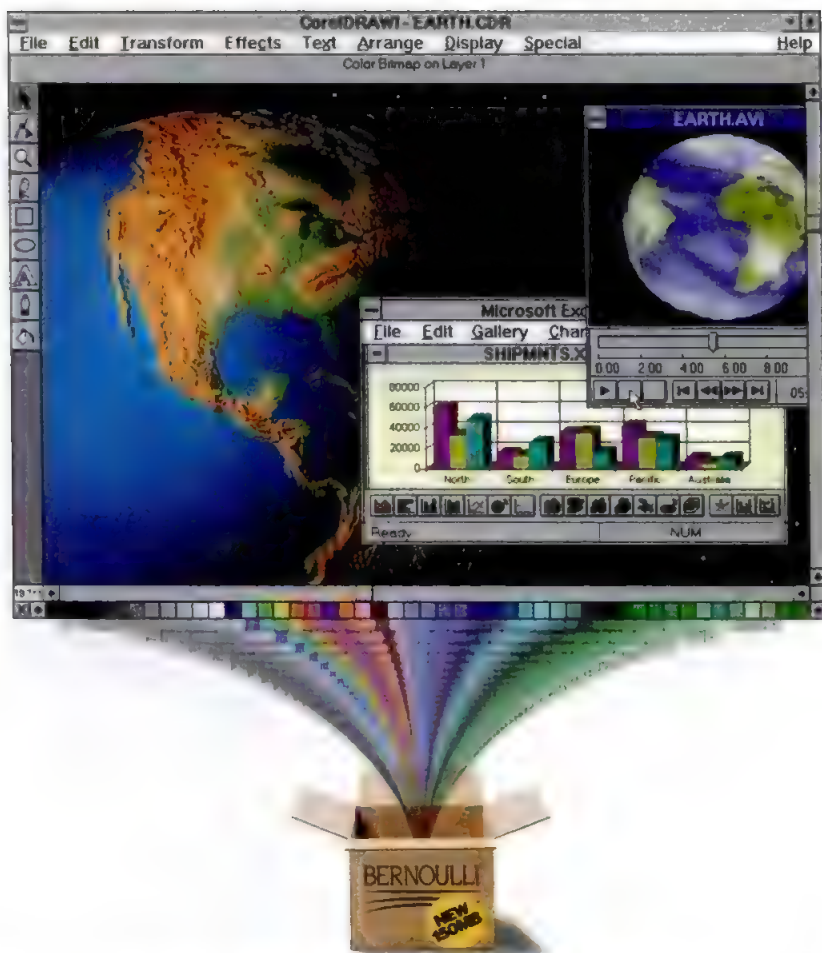


The Apollo 9000, with its 50-MHz PA/RISC chip and smooth HP/UX user interface, offers super bang for the buck and impressive graphics capability.

can house a 1GB disk, allowing 2GB of internal storage and as much as 68GB total storage via external drives. Memory size ranges from 16MB to 256MB. The EISA bus slot can be used for another LAN interface or SCSI-2 interface.

PERFORMANCE

The Apollo 9000 was a pleasure to use. Its operating system and compilers were reliable, and we were able to set it up and connect it to a LAN in just a few minutes. Windows opened and closed rapidly,



Now Windows users are opening
a new world of possibilities.

The new Bernoulli® 150. The standard in removable storage.



The Bernoulli 150 is a MultiDisk drive. So it not only reads/writes 150MB disks, but 35, 65, 90 and 105MB disks, too. It even reads our 44MB disks.

More excitement. And frankly, more storage.

With the new Bernoulli, you can explore new ideas without running out of space. You just add inexpensive disks in the sizes and prices you need—150, 105, 90, 65 & 35MB. That's what we call MultiDisk™

Ah, the things you can do with software these days. Amazing, isn't it?

That's why we created the new Bernoulli 150 removable drive. So you can get more out of your storage than ever before—more free-

a feature you can only get with the Bernoulli 150.

What's more, you can take your data where you need it, when you need it. Free from worry.

And since no one has time to sit on their hands, we offer a very quick 18-msec effective access time.

As you might have guessed, only award-winning Bernoulli Drives give you this much potential.

CorelDRAW bundle offer. Call 1-800-695-4035.

Sound good? Give us a call today for more information. Or visit your local dealer. And from now on, expect the world out of your storage.

OMEGA®
Makers of Bernoulli

©1993 Iomega Corp. The Iomega logo and Bernoulli are registered trademarks, and MultiDisk is a trademark of Iomega Corp. All other products are trademarks of their respective holders. For customer service in U.S.A. and Canada, call 1-800-456-5522. In Europe, call 49-761-45040. For worldwide customer service, call 1-801-778-3000. For accessory items, call IOMART at 1-800-723-3770.

CIRCLE 376 ON READER SERVICE CARD





TO DESIGN OUR NEW MOUSE, WE STARTED BY READING PALMS.



In relentless detail, we studied hands of all dimensions.

We consulted professors of kinesiology, engineers, ergonomists and computer users. We used digital fiber optics to analyze the human hand. We followed it in motion.

The result is a new Microsoft® Mouse that is, well, anatomically correct. Uncommonly comfortable.

The palm is perfectly supported. Left or right handed, the grip is comfortable. Fingertips fall naturally into place. A click feels just right.

This mouse even looks good. Intriguingly asymmetrical. Yet it somehow reminds you of the gentle curves of a human form.

Did we mention that it also has some innovative new software features? They allow you to customize the mouse, so it works the way you like to work.

Try the new Microsoft Mouse. If you're not comfortable, we'll refund your money. Guaranteed. Details are on the box, which you can quickly get your hands on at a computer store near you.

Microsoft
Making it easier

Unix commands were executed quickly, and applications ran faster than they did on other workstations. Part of this performance is due to HP/UX, HP's version of Unix. But HP's 9000/700 series machines also have the fastest 2-D graphics hardware available at any price level, and the hardware makes users' lives more pleasant through the responsive graphical user interface.

Two-dimensional X11 graphics performance was outstanding. We measured 860,000 10-pixel vectors per second using normal software programs. This is twice the performance of most other workstations and perhaps 10 times the speed of typical PC VGA displays.

HP has done an excellent job of pricing its machines according to their performance. Whether a unit's performance is measured in SPECmarks, MFlops, Dhrystones, or Khornerstones, workstation price/performance ratios are constant across the HP product line. The cur-

rent price/performance level of HP's line is twice as attractive as that of the 9000/700 series workstations introduced in 1991. The high-end Model 735 has about twice the performance of the Model 715/50, which in turn has about twice the performance of the Model 705. The Model 735 has dual 256K instruction and data caches, a 99-MHz processor, up to 400MB of RAM, two internal storage devices, and SCSI-2 and "fast and wide" SCSI-2 interfaces as standard.

SOFTWARE APPLICATIONS

There are several thousand software applications available for HP machines from third-party suppliers. They range from word processing and spreadsheet software to advanced engineering applications. HP primarily provides operating system, language, graphics, and communications programs. Although there are many software applications available for HP machines, there are not nearly as many varieties of packages as there are for popular applications in the PC arena.

HP's System Administration Manager (SAM) is a menu-driver shell that lets users perform most tuning and administration functions without requiring that they know the underlying operating system file requirements. The HP/UX operating system permits file striping across multiple drives, which boosts performance and allows users to build large file systems (the total size is the combined size of all the striped disk drives). File system performance increases almost linearly with the number of hard disk drives striped, at least through four or five drives. SCSI disk rates of 6MB to 12MB per second are possible when using a fast and wide SCSI interface working with multiple striped hard disks.

CONNECTIVITY

HP workstations all support Ethernet LANs, and those with an EISA slot can support Token-Ring and Fiber Distributed Data Interface (FDDI) networks.

We were impressed that the HP Apollo 9000 lets users change from one LAN configuration to another by merely swapping a board (a 5-minute task) and changing a simple set of software administration menus (another 5 minutes). At this

point, the machine is fully operable with all its software on a completely different network.

Three HP packages offer different ways of connecting to DOS machines. For PC users, HP offers a DOS emulator called SoftPC. We saw a tenfold difference between native

Unix performance and emulated PC performance, but HP's SoftPC is able to achieve a relatively faster speed, depending on the model used. For workstation users who occasionally run DOS applications, this performance is acceptable. Insignia Solutions (the developers of SoftPC) will soon be offering a SoftPC upgrade that will run Microsoft Windows, Version 3.1, in enhanced mode.

HP LAN Manager/X lets a workstation act as a file and resource server for PCs running DOS, Windows, and OS/2. The package provides file and peripheral sharing, printer spooling and management, station-to-station messaging, and APIs (application programming interfaces) for program development. HP also supports a NetWare product that provides a fully NetWare-compatible server. HP's adherence to network standards also allows a variety of third-party packages, running on DOS machines, to access HP workstations transparently across a network.

CONCLUSIONS

The drawbacks to the Apollo 9000 (and to workstations in general), are its price and the limited availability of general office applications. The cost of HP midrange workstations can be justified primarily for their FPU-intensive, scientific, and engineering applications, such as CAD and CAM. The Apollo 9000 also makes a terrific LAN server. Database applications that are CPU and disk inten-

SUITABILITY TO TASK				
HP Apollo 9000 Model 715/50				
	POOR	FAIR	GOOD	EXCELLENT
Applications development	●	●	●	●
Connectivity	●	●	●	○
Engineering/scientific/ 2-D CAD	●	●	●	●
Desktop publishing	●	●	●	○
3-D graphics	●	●	●	○
Office productivity	●	●	●	○

FACT FILE

HP Apollo 9000 Model 715/50
Hewlett-Packard Co., Direct Marketing Organization, P.O. Box 58059, Mail Stop 511L-JJ, Santa Clara, CA 95051-0859; 800-752-0900

List price (tested configuration): \$17,240
Motherboard and CPU: HP PA/RISC 7100, 50 MHz, 32MB RAM; 64K instruction and 64K data cache.
Storage: 1GB hard disk; 8GB tape drive.
Display: 1,280-by-1,024, 12MB VRAM, 19-inch color monitor
Graphics controller: CRX integrated controller
Network adapter: Built-in Ethernet support.
Software: HP-UX 9.0; PEX; PHIGS; Starbase; GKS. HP Fortran 9.01 (\$2,095); switches used: +03 +0P4 (for most tests). HP C 9.00 (\$2,090); switches used: +03
Graphics library: X11.
In short: The HP Apollo 9000, arguably the best all-around performer in the roundup, was at or near the top in virtually every performance category. While the price of the HP tends to match similarly configured workstations, the performance of the HP is generally better, resulting in a better overall price/performance value. The higher cost of an HP midrange workstation, as opposed to an Intel-based PC, can be justified primarily for floating-point-intensive scientific and engineering applications (such as CAD/CAM).

476 ON-READER SERVICE CARD

All for one? One for all.



Introducing the HP LaserJet 4M.

Now everyone can tap the power and performance of an HP LaserJet printer. The HP LaserJet 4M. A printer made with everything your PC and Mac users expect: built-in genuine PostScript™ Level 2 from Adobe™, 6 MB of standard memory, standard LocalTalk, optional EtherTalk, built-in Windows TrueType fonts, and

the best 600-dpi print quality available.

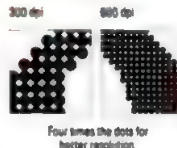
Greater flexibility for mixed environments.

Because it's designed to be shared simultaneously, the LaserJet 4M gives you greater flexibility for mixed environments without compromise to either. Automatic language

switching between PCL 5 and PostScript, 3 hot I/O ports, and new RISC processor make sure no one will have to wait around for this printer.

The finest print quality in its class. With HP's microfine toner, Resolution Enhancement technology, and 600 × 600-dpi engine, the new LaserJet 4M

printer also delivers the finest 600-dpi print quality available.

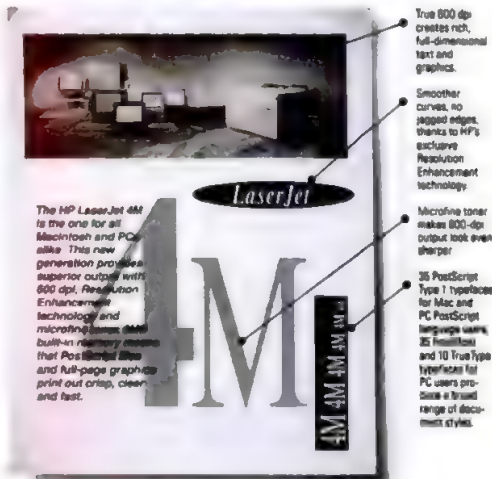


Its wide range of typefaces, two integrated paper trays, and the options of a 500-sheet tray and a power envelope feeder set a new standard in versatility.

HP quality and reliability.

Of course, with the LaserJet 4M printer, you'll enjoy HP's renowned quality and reliability. All for only \$2,399*. So call 1-800-LASERJET (1-800-527-3753), Ext. 7341** for a free print sample! Or visit your nearest authorized HP dealer.

If it isn't a LaserJet, it's only a laser printer.



sive may make effective use of the power of a machine like the Apollo 9000. Also, some network-related applications can benefit from the use of this type of machine. Most users, however, do not yet need this kind of power.

As with most product lines, choosing an HP workstation involves a trade-off between price and performance; more money buys you a substantially faster system with more expansion capabilities. But while the pricing of HP units tends to match that of similarly configured machines from other vendors, the performance of HP machines is generally higher. In terms of price/performance alone, an Intel PC platform may still look more attractive, but based solely on performance, an HP unit is a solid choice.

IBM Corp.

IBM RS/6000 PowerStation 365

BY DAVID WILSON

Like Hewlett-Packard Co., IBM Corp. is selling performance in its workstations. Since the introduction of the RS/6000 line in 1990, IBM has more than tripled the systems' performance—a pace that has kept its machines competitive. RS/6000s are mainly installed in scientific/engineering environments, and IBM has introduced multiprocessor systems that are aimed at high-end scientific applications.

As a result of IBM's size and considerable marketing clout, a number of its RS/6000 systems have also been sold into multiuser commercial environments. The power of the systems, when combined with broad network offerings and RS-232 communications interfaces, enable an RS/6000 to serve a number of terminals. The raw performance of the systems is generally acceptable for database or general business applications, and several vendors offer RS/6000 server-based image systems that support multiple PC clients running Windows (such as Bull,



The PowerStation 365's floating-point prowess makes it a top contender in the CAD/CAM arena. RS/6000 technology is the basis for PowerPC chips being developed by IBM, Motorola, and Apple.

FileNet, IBS, Plexus, and Wang).

PowerStation performance ranges from the 25-MHz PowerStation 320H to the 62.5-MHz PowerStation 375. The PowerStation 365 that we tested has a 50-MHz clock rate. Priced at \$23,435, it includes two serial ports, one parallel port, a SCSI interface, integrated Ethernet, a 1GB SCSI drive, and a Gt4e graphics card. It also has one MicroChannel bus slot and 32MB of RAM. A keyboard, mouse, and 19-inch color monitor complete the system. AIX, IBM's version of Unix, is bundled with the system (previous RS/6000 systems required AIX to be ordered separately).

The PowerStation 365 is the middle offering of three newly introduced RS/6000 desktop systems that range in price from \$15,995 to \$25,495. On the high end, RS/6000 PowerServers can have anywhere from 16MB to 128MB of RAM and range in

price from less than \$10,000 to more than \$100,000. Other than clock rate, the key differentiating factor among the various RS/6000 models is cache size. RS/6000s use small caches. The PowerStation 365 has a 32K data and 32K instruction cache, which is the largest cache available on an IBM desktop system. Despite the small cache size, the PowerStation 365 did well

on most application and performance tests. Other workstations, such as the Sun SPARCstation 10 Model 41, have a 1MB external cache and an internal cache. Cache size alone does not necessarily determine system performance; system design is also crucial.

The future of the Power architecture looks good on the low end, with Apple Computer and IBM collaborating on the RS/6000-based PowerPC chip and Apple adopting RS/6000 chips for some of its systems. Continued clock-rate or architectural improvements in mid-

range systems like the PowerStation 365 will be required to keep RS/6000 machines in the forefront of the workstation market.

PERFORMANCE

The PowerStation 365 showed excellent floating-point and disk performance. Only HP workstations can compete with RS/6000 systems in floating-point calculations. In integer and disk performance, the PowerStation 365 did well, but it did not stand far above other similarly priced systems. HP, Silicon Graphics, and Sun workstations have similar or better integer performance.

While past IBM workstations have been relatively weak in graphics capability, the PowerStation 365 comes with IBM's Gt4e accelerated graphics card. It showed good performance on application tests but slow response in Microsoft Windows operations. Although a PowerStation 365 equipped with a Gt3 card is an acceptable performer, it trails the fastest midrange graphics systems.

When we ran the SPECmark suite of tests on the PowerStation 365, we achieved only about 80 percent of the unit's claimed floating-point performance and a somewhat higher percentage of CPU performance. IBM's compilers generate excellent code, but the sheer number of options presents a problem. Achieving optimal performance requires a great deal of effort by the developer. Other vendors' machines (such as the Sun and Silicon Graphics units) also have this type of compiler library problem.

SUITABILITY TO TASK				
IBM RS/6000 PowerStation 365				
	POOR	FAIR	GOOD	EXCELLENT
Applications development	●	●	●	●
Connectivity	●	●	●	○
Engineering/scientific/ 2-D CAD	●	●	●	●
Desktop publishing	●	●	●	○
3-D graphics	●	●	●	○
Office productivity	●	●	○	○

FACT FILE

IBM RS/6000 PowerStation 365

IBM Corp., Old Orchard Rd.,
Armonk, NY 10504; 800-426-3333

List price (tested configuration): \$23,435

Motherboard and CPU: Power, 50 MHz; 32MB RAM,
32K instruction and 32K data cache

Storage: 1GB hard disk, two 1.44MB 3.5-inch SCSI
drives, 1.44MB 3.5-inch floppy disk drive.

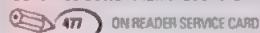
Display: 1,280-by-1,024, 19-inch color monitor

Graphics adapter: G14e accelerated graphics card

Network adapter: Built-in Ethernet

Software: AIX, Version 3.2.3 IBM XL F Fortran 2.2.1
(\$1,520); switches used: -O (except for some SPEC
tests) IBM XL C 1.2; switches used: -O. Graphics li-
brary X11

In short: Although we experienced some problems,
our overall impression of the IBM RS/6000 Power-
Station 365 was positive. It is ideally suited for floating-
point-intensive engineering and scientific applications,
and can serve as a strong multiuser business system.
In CPU and graphics performance, the RS/6000 is com-
petitive with other workstations and outdistances PCs.
It is in the upper range of IBM RISC performance at
a moderate workstation price. As configured, the sys-
tem offers good value. Its price/performance ratio is
four times better than that of the first RS/6000 systems.



ON READER SERVICE CARD

Only HP's compilers achieved close to the claimed SPECmark performance.

Our PowerStation 365 developed an operating system problem when an application (Cadam) was removed from the system. Something had been disturbed, and a substantial portion of the disk was not allocated. SMIT (System Management Interface Tool), IBM's system administration utility, was unable to reallocate the disk space until we discovered the correct pair of commands. What should have been a simple process took several hours to fix.

SOFTWARE

AIX is an unusual version of Unix, with a number of advanced features and peculiarities. Although IBM's documentation is hefty, we regularly ran into problems or commands that were not covered. Our experience with other Unix versions did not translate easily, and we ended up placing more calls to IBM support than

we would have liked. Unlike most competitive Unix versions, however, the size of AIX files can be expanded after the system is set up, which we found useful.

AIX is a large operating system, and the installation process is both complex and time consuming. It is daunting to run out of room on a 400MB hard disk when installing only the operating system, an X11 graphics library, and an optional compiler. Although AIX is now a bundled option on the three new PowerStations, users may have to install AIX upgrades. A 1GB hard drive in an RS/6000 that is being used as a development system should not be considered overkill.

The PowerStation 365 has a powerful information utility called InfoExplorer. Beyond the usual manuals that Unix systems have on-line, InfoExplorer gives full access to IBM manuals. It has a variety of access modes for finding information in context and appears to be the most powerful of the retrieval systems available in the workstation market. InfoExplorer comes bundled with AIX, which differs from the optional information utilities of other vendors (such as Sun). With SMIT, an administrator can add peripherals, control the file system, add users or software, and control nearly all aspects of the system configuration and operation.

CONNECTIVITY

The PowerStation 365's networking performance was strong on some tests and weak on others. Using a Sun 630 MP as a server, performance tests run on the IBM system showed only fair NFS (Networked File System) performance.

As an "open system" vendor, IBM supports a number of standard Unix facilities. Thus, PCs that support TCP/IP or NFS can connect to RS/6000 networks, and a PC running an X11 server can connect to RS/6000 machines without problems. IBM provides a DOS emulator under AIX, as well as a solid portable NetWare offering. An AIX version is available for Intel-based PS/2 systems, which provides a parallel development and runtime environment across the PS/2 and RISC lines.

CONCLUSIONS

Although we experienced some problems, our impression of the PowerStation 365 was positive. Like the HP workstation we tested, the PowerStation 365 is ideally suited for floating point-intensive engineering and scientific applications. The workstation also can serve as a strong multiuser business system. In CPU and graphics performance, it is competitive with other workstations and far outdistances PCs.

As with any system evaluation, the key issues involved here are performance, price, and application availability. The performance of the PowerStation 365 is excellent, but the cost is high. As PC systems such as Pentium-based machines reach higher levels of performance, increasing numbers of applications once suited for workstations are becoming viable on PCs. Although there will always be applications that require workstation power, a greater percentage of applications will fall within the performance range of low-cost systems. While there are many applications currently available for RS/6000 systems, the PC market offers more choices among popular programs.

Silicon Graphics Inc.

Silicon Graphics Iris Indigo R4000 XZ

BY DON CRABB

Silicon Graphics. The name really says it all. These Unix workstations are justly fa-



Silicon Graphics' Indigo XZ is the champion of 3-D graphics. Silicon Graphics machines are being employed by Hollywood studios to produce dazzling movie special effects.

mous for their prowess at churning three-dimensional graphics rasters faster than you can say, "Render me." For this roundup, we chose to test a Silicon Graphics Indigo R4000 XZ, which at \$30,200 cost the most of any of the machines that we looked at.

What do you get for all that money? Workstation Labs' tests proved that you get extremely fast graphics performance—orders of magnitude faster than the Compaq and Sun units tested

and considerably better than the IBM and Hewlett-Packard offerings here. The Indigo XZ also proved to be fast at cranking out floating-point operations, and it was simply stellar on the Khornerstone tests. We can give you the bottom line on the Indigo XZ up front: Buy one if you absolutely must have top floating-point and graphics performance—and you don't care about price.

GRAPHICS PERFORMANCE

The tested Indigo XZ included 32MB of RAM, a 16K processor cache, a 1.2GB SCSI hard disk drive, built-in Ethernet, and built-in Networked File System (NFS) capability, as well as the Silicon Graphics Irix 4.0.5 version of Unix. The Indigo XZ we looked at had a 19-inch color monitor with 1,280-by-1,024 resolution, 24-bit color depth, a hardware Z buffer (which further speeds up graphics redraws), and an XZ-24 graphics engine. C language (\$1,200) and FORTRAN compilers (\$1,195) are options with the Indigo XZ, as is the NFS (\$595).

If you plan to render 24-bit images, edit audio and video data, or do integrated media publishing, the Indigo XZ may not be enough for you. Fear not, however. Simply double the price and buy an Indigo2 Extreme with a MIPS R4400 150-MHz CPU and the Extreme graphics option. The Extreme graphics engine in the Indigo2 Extreme rolls together eight Geometry Engine processors for providing 24-bit display color and a 24-bit color frame buffer.

SOFTWARE

What defines an Indigo XZ (besides its stellar floating-point and graphics performance) is its Irix operating system, which is based on IEEE Posix 1003.1 and AT&T System V, Release 4, Unix versions (which include the University of California at Berkeley's BSD 4.3 enhancements). Irix, Version 4.05, includes the X11 Windows package, which is a nice version of OSF/Motif (with the Motif Window Manager

and Display Postscript).

Irix also includes the Iris GL graphics extensions; the Iris Showcase audio, video, and hyperlink extensions for doing color presentations; ImageVision; Iris Explorer; and Media Mosiac. All of these make it easy to manipulate images and image libraries.

CONNECTIVITY

The Indigo XZ is no Unix slouch either. Irix comes with all the usual Unix connectivity pieces: TCP/IP, NFS, Ethernet, and many others you might not expect in a Unix box, including Fiber Distributed Data Interface (FDDI), DECnet and LAT emulators, TCP 3270 and SNA 3270 emulators (for those of you who must have IBM 3270-style connectivity), and Macintosh EtherTalk.

SUPER SILICON GRAPHICS

Silicon Graphics plans to expand the supercomputer market by bringing prices below a million dollars per machine and by focusing on its traditional graphics, scientific, engineering, and entertainment markets. Some existing Silicon Graphics workstations, such as a full-blown Indigo2 Extreme, can be considered supercomputers. This all bodes well for potential buyers if they are considering incorporating today's Silicon Graphics workstations into their environments and eventually want a software growth path to true supercomputers.

PowerChallenge, a new line of RISC-based supercomputing servers, includes

the L model and the XL model, which will have up to 5.4 gigaflops of peak performance. Starting prices range from about \$120,000 to \$170,000, and the products will be available by the first half of 1994. Challenge, a line of servers that includes up to 36 processors, shipped during the first half of 1993; prices range from \$20,000 to \$120,000. Onyx should be ten times more powerful than any previous Silicon Graphics workstation (including the Indigo2 Extreme) and will include two graphics subsystems: RealityEngine2 and VTX. Onyx will be available later this year; prices will range from \$114,900 to \$634,900. Each of these systems is based on the single-processor MIPS R4000 chip set or the symmetrical multiprocessing MIPS R4400, developed by

SUITABILITY TO TASK				
Silicon Graphics Iris Indigo R4000 XZ				
Applications development	●	●	●	○
Connectivity	●	●	●	●
Engineering/scientific/2-D CAD	●	●	●	○
Desktop publishing	●	●	●	●
3-D graphics	●	●	●	●
Office productivity	●	●	○	○

FACT FILE

Silicon Graphics Iris Indigo R4000 XZ

Silicon Graphics Inc., 2011 North Shoreline Blvd., P.O. Box 7311, Mountain View, CA 94039-7311; 800-800-4744, 415-960-1980; fax, 415-961-0595

List price (tested configuration): \$30,200.

Motherboard and CPU: MIPS R4000SC, 50 MHz (100 MHz internal); 32MB RAM; 8K data cache and 8K instruction cache

Storage: 1.2GB hard disk, .25-inch 150MB tape drive, internal 3.5-inch floppy disk drive, external CD-ROM drive

Display: 1,280-by-1,024, 24-bit Z buffer, 5MB VRAM, 19-inch color monitor.

Graphics subsystem: XZ Graphics, including a raster engine processor and two Geometry Engine processors.

Network adapter: Built-in 10BaseT Ethernet support, optional FDDI support.

Software: Irix 4.05, Iris Showcase 2.0 presentation graphics; Media Mosaic digital media tools; Iris Insight on-line documentation; OpenGL, implementation of Iris Graphics Library; Silicon Graphics Fortran 3.10 for most tests (\$1,195); *switches used:* -O3 for most tests. Silicon Graphics C 3.10 (\$1,200) for most tests; *switches used:* -O3 for most tests. Graphics library: X11, GL.

In short: Because of its connectivity prowess, stellar graphics, floating-point performance, and multimedia capabilities, a Silicon Graphics Iris Indigo R4000 XZ makes a good investment for a PC owner who is interested in building a graphics workstation for specialized work.

478 ON READER SERVICE CARD

It's So Remarkable, We Hate To Call It A Computer. Luckily, Its CD-ROM Reference Library Can Come Up With A Better Term.

Because, as a rule, computers don't answer your phone and take a personal message when you're at a sales meeting in Schenectady, like the Sensation can. And they can't give you an animated model of the double helix formation that builds a DNA molecule, like the

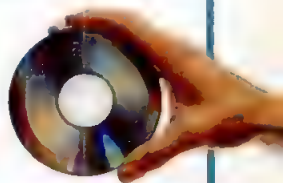
Sensation will. And they certainly can't play a strict four-part fugue in full digital stereo, which, by the way, the Sensation does. And when was the last time a computer read your agenda over the phone when you forgot



The Intel Inside logo is a registered trademark of Intel Corporation. IBM is a registered trademark of IBM Corp.

where you were supposed to be at 2 o'clock? Or faxed off a quick note to the school nurse when your youngest son had a bad case of the sniffles? Or told you the correct way to pronounce a word such as "threnody"? Or even played you the late local

news? Of course, the Sensation can do any one of them. So you can see why it just doesn't seem appropriate simply to call it a computer. And why we'd rather just go ahead and let the Sensation speak for itself.



CIRCLE 289 ON READER SERVICE CARD

TANDY
Sensation!

Not just IBM-PC Compatible, Family Compatible.

Available exclusively at Radio Shack.

MIPS Computers Systems (which became a wholly owned subsidiary of Silicon Graphics last year).

CONCLUSIONS

You might buy an Indigo XZ to run a high-end desktop publishing program such as Interleaf, PageMaker, or FrameMaker. You could also buy it to run the expensive 3-D graphics and CAD software that you could run on a Sun SPARCstation LX, HP Apollo 9000, or IBM RS/6000. In both categories, the Indigo XZ does an excellent job.

A better reason to buy an Indigo XZ, however, is so that you can run those types of applications in concert with real-time image processing, 3-D modeling, and animation software (the unit does an absolutely beautiful job of performing advanced graphics like texture mapping, object transparency, spotlighting, alpha blending, full-scene antialiasing, and ray tracing).

The Indigo XZ handles video and audio with aplomb and is clearly equal to or better than an Apple Macintosh Quadra at doing so. You can add in an Indigo Video board to digitize low-end video, or you can configure your Indigo to work with broadcast-quality video and audio sources. The Indigo XZ's dedicated video bus screams along at a maximum transfer rate of 133MB per second. At those speeds, you don't have to worry about video and audio compression and the artifacts they leave.

In fact, one excellent way to use the Indigo XZ would be to use it as a miniature desktop recording studio. Indigo machines support 24-bit digital and 16-bit analog stereo sound while handling line and microphone analog inputs and outputs. The board uses a 56001 digital signal processor to handle real-time data transformations, and the multiprocessing Irix operating system interfaces with the board without wasting CPU cycles.

Because of its connectivity prowess, stellar graphics, floating-point performance, and multimedia capabilities, an Indigo XZ makes a good investment for a PC owner looking to build a graphics workstation for specialized work that even a Pentium-based PC, Macintosh Tempest, or Cyclone wouldn't be able to manage.

Don't think of the Indigo XZ as a

high-end PC, however, because like the other Unix workstations tested here, it is not. You still have to deal with user and management problems that even a nice Unix like Irix can present (not the least of which is the hassle of what should be simple software installation). The Indigo also lacks the multiplicity of applications provided by a Compaq or a Quadra, although Silicon Graphics' catalog of available third-party productivity applications beats the HP, IBM, and Sun catalogs hands down.

The Indigo XZ was the fastest machine tested at 3-D graphics, but it was also the most expensive. It handled floating-point calculations very well, making it both suitable for engineering and scientific environments, as well as a good choice for power desktop publishing. It's no wonder that Indigos are so often used by Hollywood firms for animation renderings. (An Indigo workstation was used to create the magnificent photographic-quality background of the ballroom dancing scene in *Beauty and the Beast*.) Because of the growing cadre of productivity applications, the Indigo XZ can also do double duty at basic office computing. But considering its hefty price tag, it ought to.

Sun Microsystems Inc.

Sun SPARCstation LX

BY DON CRABB

We might as well cut to the chase. Most PC owners won't buy a Sun SPARCstation LX anytime soon. In fact, we don't think Unix fans will be enthralled with this machine either. It was the slowest among the Unix workstations on almost every performance test. Although it was also the cheapest Unix workstation tested, its price/performance ratio was not impressive and was easily eclipsed by that of the Compaq Deskpro 5/66M unit running SCO Unix.

Our tests showed that if you really want solid Unix workstation performance from a Sun, you need to buy a machine at the same level as the other

Unix boxes tested here: the HP Apollo 9000 Model 715/50, the IBM RS/6000 PowerStation 365, and the Silicon Graphics Iris Indigo R4000 XZ. For that kind of money (\$17,240-\$30,200), you can buy a Sun SPARCstation 2-class machine of similar performance.

The SPARCclassic is a much better



Sun's low-end SPARCstation LX is best suited as a PC server or Sun network client, thanks to its excellent PC connectivity and networking tools.

buy than the SPARCstation LX, and unless you really need the graphics acceleration, it will fit just fine into an existing Sun Networked File System (NFS) server Ethernet network.

Many PC users are in a quandary as to when and why they might buy a SPARCstation LX. You should not think of SPARCstations as ultra high-end PCs. There is still a difference between high-end PCs (like the Compaq we tested) and desktop Unix workstations. You should not buy a SPARCstation LX simply to try to run word processing and spreadsheet programs faster than you would on your current PC—that would be a waste of computing resources. Unless you have a specific application or configuration that needs Sun's Unix NFS server-based workstations, look elsewhere.

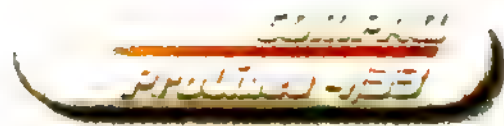
SPARCSTATION 2 PERFORMANCE

On our floating-point, integer, disk I/O, and multiprocessing tests, which gauge a computer's ability to run engineering and scientific applications quickly, the SPARCstation LX came up short. As you can see from the test scores, it ran slower than the Deskpro 5/66M, the HP Apollo 9000, the PowerStation 365, and the Indigo XZ in nearly every low-level perfor-

**SINCE WE
OFFER MORE
FEATURES FOR
LESS MONEY,
IT'S NOT
SURPRISING
HOW WE SELL
SO MANY PCs.**



WHAT'S SURPR COMPAQ



REASONS TO BUY A COMPAQ SYSTEM.

1. They have a pretty nice logo.

USING IS HOW DOES.



REASONS TO BUY A DELL SYSTEM.

- 1.** Dell® Dimension™ gives you more features for less money than Compaq ProLinea.
- 2.** Every Dell i486™-based Dimension system has twice the slots as the comparable Compaq ProLinea (6 vs. 3).
- 3.** Every Dell i486-based Dimension has 60% more storage expandability than ProLinea (5 vs. 3 drive bays).
- 4.** Every Dell i486-based Dimension has two times the maximum RAM capacity of ProLinea (64MB vs. 32MB) on the main system board.
- 5.** Every Dell i486-based Dimension has a 200 watt power supply vs. ProLinea's 145 watt power supply.
- 6.** Dell Dimension is available in a floor-standing configuration. ProLinea is not.
- 7.** Dell has been awarded 17 customer satisfaction awards in the past 5 years alone.
- 8.** Dell was ranked Customer Satisfaction Leader for IBM-Compatible PC's in the J.D. Power and Associates Computer End-User Satisfaction Study.^{SM*}
- 9.** Dell is the top-rated PC company in the 1992 Dataquest® Customer Satisfaction Survey.^{**}
- 10.** Dell was rated #1 in an independent customer satisfaction survey conducted by Reliability Ratings.TM
- 11.** Dell is the fastest growing FORTUNE 500® PC company, with over \$2 billion in sales.
- 12.** When you buy from Dell, you get support from Dell.
- 13.** At Dell, you can order your hardware and 2,400 software and peripheral products at the same time, with one purchase order. Try to get that from Compaq.
- 14.** By the way, we have a pretty nice logo, too.



800-247-2095

WHEN CALLING, PLEASE REFERENCE #11BFG.

HOURS: 7AM-9PM CT MON-FRI, 8AM-4PM CT SAT, 10AM-3PM CT SUN.

IN CANADA* CALL 800-668-3021.

TEN MORE REASONS

(AS IF THE FIRST 14)



DIMENSION 486SX/25 i486 SX 25MHz SYSTEM

- 4MB RAM • 170MB (17ms) HARD DRIVE
- 5 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- SUPER VGA 1024i MONITOR (14", 1024 x 768, .28mm)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
- MS-DOS 6.0/MICROSOFT WINDOWS 3.1/ MOUSE
- BUSINESS LEASE*: \$52/MO.

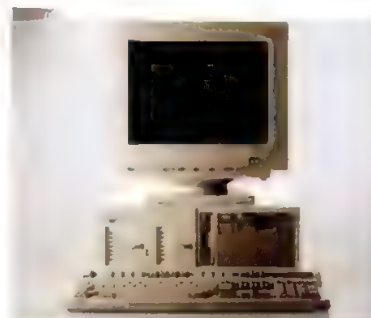
\$1,399



DIMENSION 486DX/33 i486 DX 33MHz SYSTEM

- 4MB RAM • 170MB (17ms) HARD DRIVE
- 64KB EXTERNAL CACHE
- 5 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- SUPER VGA 1024i MONITOR (14", 1024 x 768, .28mm)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
- MS-DOS 6.0/MICROSOFT WINDOWS 3.1/ MOUSE
- BUSINESS LEASE: \$63/MO.

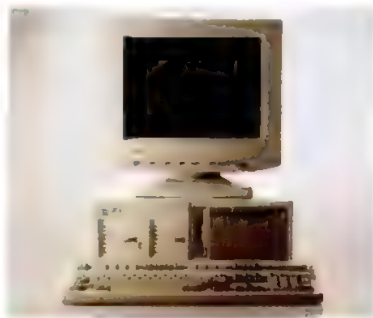
\$1,699



DIMENSION 486DX2/50 i486 DX2 50MHz SYSTEM

- 4MB RAM • 212MB (15ms) HARD DRIVE
- 64KB EXTERNAL CACHE
- 5 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- SUPER VGA 1024i MONITOR (14", 1024 x 768, .28mm)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
- MS-DOS 6.0/MICROSOFT WINDOWS 3.1/ MOUSE
- BUSINESS LEASE: \$74/MO.

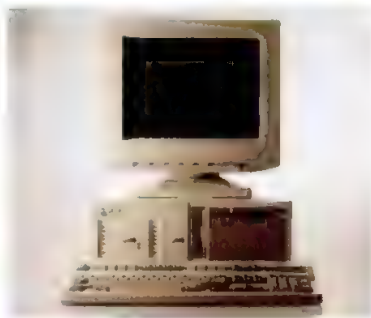
\$1,999



DIMENSION 486SX/25 i486 SX 25MHz SYSTEM

- 4MB RAM • 170MB (17ms) HARD DRIVE
- 5 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- ULTRA VGA 1024NI MONITOR (14", 1024 x 768, .28mm, NI)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
- MS-DOS 6.0/MICROSOFT WINDOWS 3.1/ MOUSE
- BUSINESS LEASE: \$55/MO.

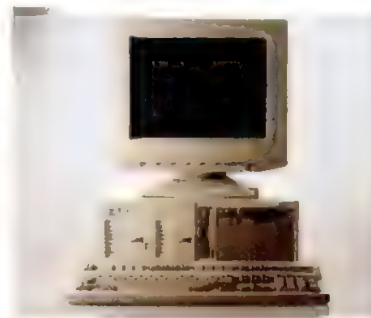
\$1,499



DIMENSION 486DX/33 i486 DX 33MHz SYSTEM

- 4MB RAM • 212MB (15ms) HARD DRIVE
- 64KB EXTERNAL CACHE
- 5 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- ULTRA VGA 1024NI MONITOR (14", 1024 x 768, .28mm, NI)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
- MS-DOS 6.0/MICROSOFT WINDOWS 3.1/ MOUSE
- BUSINESS LEASE: \$70/MO.

\$1,899



DIMENSION 486DX2/50 i486 DX2 50MHz SYSTEM

- 8MB RAM • 320MB (15ms) HARD DRIVE
- 64KB EXTERNAL CACHE
- 5 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- ULTRA VGA 1024NI MONITOR (14", 1024 x 768, .28mm, NI)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
- MS-DOS 6.0/MICROSOFT WINDOWS 3.1/ MOUSE
- BUSINESS LEASE: \$89/MO.

\$2,399

Survey was independently conducted by Reliability Ratings, Needham, MA. The data is quoted from a 40-page report available for purchase through Reliability Ratings (617) 444-5755.

*Prices valid in U.S. only. Some products and promotions not available in Canada. **Source: Dataquest, Nov. 1992. †Leasing arranged by Leasing Group, Inc. ‡On-site service provided by Bank Tec Service. trademarks of Intel Corporation. MS-DOS and Microsoft are registered trademarks of Microsoft Corporation. FORTUNE 500 is a registered trademark of The Time Inc. Magazine Company. Dell

TO BUY FROM DELL. (WEREN'T ENOUGH.)



DIMENSION 486DX/33 i486 DX 33MHz SYSTEM

- 4MB RAM • 450MB (12ms) HARD DRIVE
- 64KB EXTERNAL CACHE
- 5 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- SUPER VGA 1024I MONITOR (14", 1024 x 768, .28mm)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
- MS-DOS 6.0/MICROSOFT WINDOWS 3.1/ MOUSE
- BUSINESS LEASE: \$76/MO.

\$2,049



DIMENSION 486DX/33s i486 DX 33MHz SYSTEM

- 8MB RAM • 450MB (12ms) HARD DRIVE
- 64KB EXTERNAL CACHE
- 6 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- SUPER VGA 1024I MONITOR (14", 1024 x 768, .28mm)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
- MS-DOS 6.0/MICROSOFT WINDOWS 3.1/ MOUSE
- BUSINESS LEASE: \$85/MO.

\$2,299



DIMENSION 486DX2/50 i486 DX2 50MHz SYSTEM

- 8MB RAM • 450MB (12ms) HARD DRIVE
- 64KB EXTERNAL CACHE
- 5 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- ULTRASCAN™ 15FS MONITOR (15", 1024 x 768, .28mm, NI)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
- MS-DOS 6.0/MICROSOFT WINDOWS 3.1/ MOUSE
- BUSINESS LEASE: \$96/MO.

\$2,599



DIMENSION 486DX2/50s i486 DX2 50MHz SYSTEM

- 8MB RAM • 450MB (12ms) HARD DRIVE
- 64KB EXTERNAL CACHE
- 6 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- ULTRA VGA 1024NI MONITOR (14", 1024 x 768, .28mm, NI)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
- MS-DOS 6.0/MICROSOFT WINDOWS 3.1/ MOUSE
- BUSINESS LEASE: \$96/MO.

\$2,599

Let's see, that makes 24 reasons to buy from Dell instead of the other guys.



Among them are systems and prices like the ones to your left. (Of course,

there are over a thousand others we don't have room to show you.)

And they all come with the service and support that have

DELL
Dimension

helped us earn numerous customer satisfaction awards from firms like J.D. Power and Associates, Dataquest, and Reliability Ratings.

So if you're looking to buy a system from a company that keeps coming up with reasons to buy, call Dell.

Because to even consider buying from anyone else would be, well, unreasonable.

**ASK ABOUT SAME-DAY
SHIPPING ON OUR MOST POPULAR
CONFIGURATIONS.**

DELL

800-433-7301

WHEN CALLING, PLEASE REFERENCE #118FH.
HOURS: 7AM-9PM CT MON-FRI, 8AM-4PM CT SAT,
10AM-3PM CT SUN. IN CANADA, CALL 800-668-3021.

Reliability Ratings, the research company, is not affiliated with Dell Computer Corporation and does not endorse its products.

Corporation. On-site service may not be available in certain remote locations. The Intel Inside logo is a registered trademark and i486 and i386 are disclaims proprietary interest in the marks and names of others. ©1993 Dell Computer Corporation. All rights reserved.

■ PowerPC: *A Look at the Future*

by Don Crabb

Fast forward to January 1994. Probably with a megablockbuster commercial run during the Super Bowl, Apple will introduce the new Macintosh. The machine will be based on the PowerPC RISC architecture that Apple, IBM, and Motorola have banded together to produce as part of their Taligent venture.

The guts behind the PowerPC will be the new 32-bit PowerPC 60x CPU, which is based on the RISC chips IBM uses in its RS/6000 Unix workstations. The PowerPC 601 is the first of at least four such PowerPC 60x chips being developed.

The first PowerPC Mac will probably incorporate a version of the 601 chip running at about 50 MHz, with 8MB of RAM, a 2.8MB floppy disk drive, and built-in support for 16-bit color. Apple will include a processor-direct slot but no Nubus expansion bus. Like the 68040-based Cyclone and Tempest Macs expected this summer, which will use digital signal processing (DSP), it will feature a new high-performance I/O subsystem.

The specifications have not yet been set for the PowerPCs, but Apple's current plans call for an entry-level system that will deliver three or four times the performance of the Quadra 800 at a discount price of \$3,500.

The PowerPC 601 will be used in low-end IBM Unix workstations (which will most likely run the OS/2 operating system, IBM's AIX Unix, and a version of Macintosh Finder) and will serve as the basis of the next generation of Mac systems.

This RISC chip, which will differ radically from the 680x0 CISC chips used in current Macs, will be at the heart of the new Macs. At this point, you might be wondering how a CPU unfamiliar with Apple's system software could possibly serve as the heart of the new Macs. Welcome to the won-

derful world of software emulation. A Mac can act like a DOS machine by using a DOS emulation program like SoftPC or SoftAT (both from Insignia Solutions). SoftPC presents a standard DOS interface to DOS software (including Windows), so that the application thinks it's running on an Intel x86-based DOS CPU. SoftPC does this by translating the Mac's Motorola 680x0 instructions and its System Toolbox routines into DOS BIOS (Basic Input/Output System) and Intel x86 instructions. The same kind of software emulation occurs in the SoftPC products that run under various forms of Unix.

The problem with emulation as it's currently practiced is that it needs to be orders of magnitude faster to really pull off the illusion. So what happens when you run SoftPC Pro (the high-end version of SoftPC) on a Quadra 950? You get a DOS window that acts as though it were being displayed by a \$699, bargain-basement Intel 286 DOS clone, rather than on a nearly \$10,000 workstation.

Into this territory Apple dares to tread with its PowerPC architecture. PowerPC chips are screamers, but they know nothing about a Mac or about how System 7.1 works. Nor are they familiar with ToolBox, QuickDraw, Finder, or any of the other software underpinnings of the Mac.

Apple has two ways to tackle this problem. First, it can make its software vendors write new versions of their software that work directly with the new PowerPC chips and essentially leave behind all of today's loyal Mac customers. Or, it can come up with a software emulator that runs on the PowerPC chip and makes Mac software think it's running on a regular Motorola 680x0.

Apple has chosen both strategies. It is working with a company called Echo Logic to come up with as fast a Mac

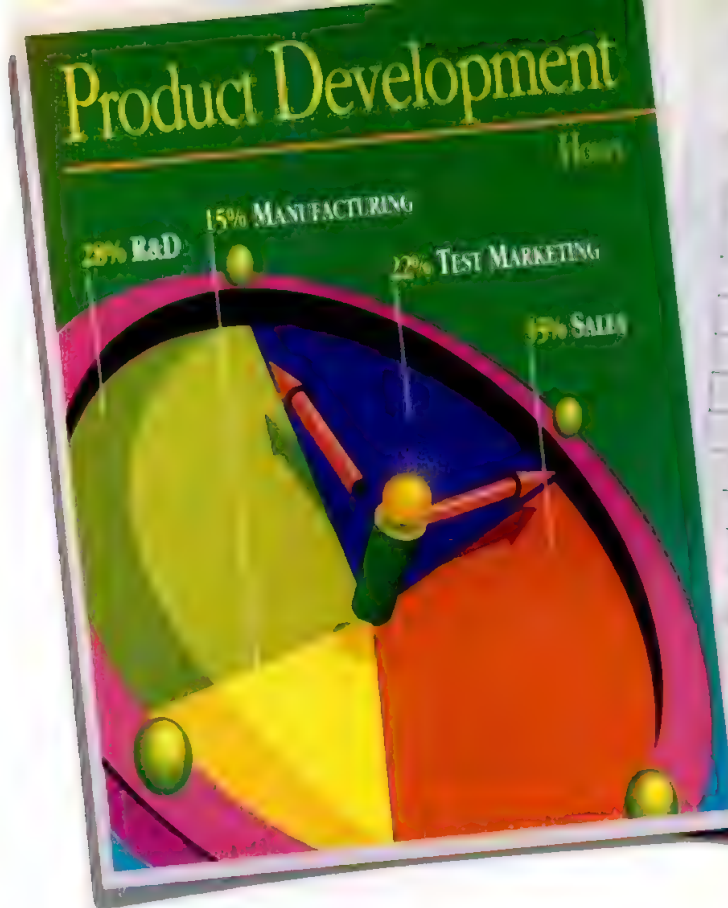
System emulator as it can for the PowerPC chips. At the same time, it's helping software vendors rewrite their applications to work with the new chip. Apple expects Echo Logic's emulation software to work fast enough so that users who buy the 1994 "PowerMacs" won't feel they were gypped buying machines that don't run the software to its full potential.

Right now, the emulator on a prototype PowerMac runs Mac software at about the speed of a standard Macintosh IIci. This isn't exactly world-class performance, but it's acceptable—or so Apple believes. What Apple really wants is to get people hooked on the potential of superfast PowerMac performance (when native mode-application software becomes available) without forcing PowerMac customers to dump their existing Mac software to buy new PowerMac programs.

There are lots of leaps of faith in Apple's strategy, of which you should be aware when doing your planning. To make the whole enterprise viable at an early stage, software vendors must field native-mode PowerMac versions of their applications in 1994. When, however, was the last time software vendors got new products out on time?

There's no doubt in our minds that Apple will eventually convince the majority of its installed base to buy PowerMacs and PowerMac applications. But there will always be a core group of MacFolk who want to wring the last bit of use out of their current machines before they hop aboard the PowerMac bandwagon. So it's unclear if—and when—Apple will drop 680x0 Macs from its line (after all, Apple still makes Apple IIs!).

The PowerPC will finally make Apple a real player in the computing performance game. And for potential Unix workstation buyers, it will add one more variable to an already overburdened selection equation. □



UNITED HEALTHCARE
PURCHASE REQUISITION

12-10

1 Tektronix Phaser 200 Color printer \$3,695.00

✓ laser paper
✓ 2pp/min
✓ Adobe PS Level 2

APPROVED

Recommend dual-tray option \$3,695.00

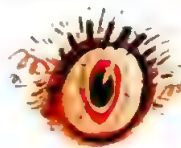
X

Our new color printer not only looks great on paper, it looks great on paper.

True, the brilliant color produced by the new Tektronix Phaser® 200 is captivating. But the price is equally attractive. And though we've become the award-winning leader in color printers by frequently outdoing the competition, this time we've even outdone ourselves. Introducing our newest business work group color printer.



The eye when it sees black and white.



The eye when it sees color.

The Phaser 200 is compatible with virtually any business software and can print two colorful pages per minute. No, not two minutes per page—two pages per minute. And even at a speed like that, it still manages to print eye-catching color on common laser paper or transparencies using a separate input tray for each. You select the medium you want at your computer keyboard. And it switches automatically from user to user just as easily, using its parallel, serial, AppleTalk™, or optional EtherTalk™ and Ethernet™ ports.

It has all the advantages of a laser printer. True Adobe PostScript™ Level 2, networkability, Pantone® colors, speed and price. (Did you notice it's only \$3695, slightly below unheard of?) And when you add to that extremely high materials capacity and sparkling TekColor™ output—not just any color, but the indisputably best color in the business—you've got something even better than our previous best. Which is quite a feat.

So stop by your nearest Tektronix dealer or call us at 800/835-6100, Dept. 28E for a free output sample. For faxed information call 503/682-7450, ask for document #1223. You won't find another business investment that looks this good on paper.



Tektronix

Phaser is a trademark of Tektronix, Inc. PostScript is a trademark of Adobe Systems, Inc. All other marks are trademarks or registered trademarks of their respective companies.

CIRCLE 001 ON READER SERVICE CARD

See us at
COMDEX
Booth # W240

mance test. It did excel on some graphics performance tests and on the recursive part of the Stanford multiprocessing tests, a showing indicative of good client/server behavior. This makes the unit a good choice to serve as a client in a large network, perhaps for SQL database applications. Another good use of a higher-end SPARCstation LX would be as a server for a group of PCs running graphics software.

The Sun SPARCstation LX we tested ran Solaris 2.1 as the OS, with Sun's FORTRAN 2.0.1 and C 2.0.1 in workstation performance testing. There are dozens of other SPARCstation platforms, which range from lower-performance, diskless desktop units such as the SPARCstation ELC (less than \$3,000) to high-performance, rack-mounted, tower SPARCservers in multiprocessor configurations (priced at more than \$100,000 for systems with more than four SPARCstation CPUs and niceties such as built-in Fiber Distributed Data Interface fiber-optic networking).

SOLARIS 2.1

Solaris 2.1 includes the multiprocessing SunOS 5.x, which is based on Unix System V, Release 4. Solaris also includes a windowing system environment called OpenWindows, coupled with a graphical user interface called OpenLook and DeskSet; Sun Open Network Computing modules, which include NFS and the TCP/IP networking protocols; and a set of object-based development tools.

This full suite of systems software and tools is included with the SPARCstation LX and is one of the reasons that you need plenty of disk space in order to run SunOS. It is also one of the reasons that you might purchase a Sun workstation. Solaris 2.1 stands as one of the most solid of the Unix implementations currently available and provides stiff competition for the other 32-bit operating environments (such as AIX, A/UX, System 7.1, and Windows NT).

Sun is moving its own operating system prowess toward multiple compatibility. You can already run DOS applications on your SPARCstation LX using a third-party emulation package from Insignia Solutions called SunPC. You will soon be able to run Solaris 2.0 on 486- and Pentium-based PCs, while also running native-mode DOS applications.

Because Solaris is Unix, it works with all the usual Unix methods of sharing data and passing control among applications (like pipes, multithreaded program execution, and preemptive multitasking). You could also use a third-party networking OS, such as NetWare or AppleTalk, to complete the Sun-to-PC connection. The SPARCstation LX can also read and write DOS 3.5-inch floppy disks directly and can even run DOS software through the use of a third-party DOS emulator like Insignia SunPC. Simple serial connections can also be made with the SPARCstation LX.

Unix, of course, doesn't need some of the clumsier interapplication communications (IAC) techniques now being used by Apple's System 7.1 (Apple Script, Apple Events) and Microsoft Windows (OLE, DDE) to get around those systems' basic operational deficiencies. From a user's point of view, however, those IAC techniques are more directly controllable than are Unix's fairly arcane mechanisms. This is one reason Sun is

putting so much effort behind Object Request Broker (ORB), which it has been developing with Hewlett-Packard over the last two years. Sun hopes to bypass the fairly elementary IAC implementations by going directly to true plug-and-play object modules that users can use to build their own applications on the fly. (Apple and IBM are seeking the same prize with their Taligent/Pink initiative and PowerOpen development.)

APPLICATIONS SOFTWARE

You will find more CAD and high-end graphics applications for the SPARC-

FACT FILE

Sun SPARCstation LX

Sun Microsystems Inc., 2550 Garcia Ave.,
Mountain View, CA 94043; 415-336-0600;
fax, 415-969-9131

List price (tested configuration): \$9,565.

Motherboard and CPU: microSPARC, 50 MHz; 24MB RAM; 2K data and 4K instruction cache

Storage: 424MB hard disk, 3.5-inch 1.44MB floppy disk drive, CD-ROM drive

Display: 1,152-by-900, 1MB VRAM, 16-inch color monitor

Graphics controller: GXplus integrated controller.
Network adapter: Built-in 10BaseT Ethernet

Software: Solaris 2.1; SunOS; ONC, OpenWindows, Version 3; DeskSet; OPEN LOOK; SunVision; SunPHIGS; XGL; SunGKS; Xlib; PostScript. Sun Fortran 2.0.1 (\$1,095); switches used: -O4. Sun C 2.0.1 (\$695); switches used: -O4. Graphics library: X11.

In short: Because of the continued slow migration of mainstream office productivity software, the Sun SPARCstation LXs are generally a poor choice for basic business desktop computing, in addition to being mediocre performers at the tasks we tested. You might buy a SPARCstation LX to run engineering and scientific applications, or to perform database functions in a client/server environment. The SPARCstation LX is best suited for use as a PC server or Sun network client.

 479 ON READER SERVICE CARD

SUITABILITY TO TASK				
Sun SPARCstation LX				
Applications development	●	●	○	○
Connectivity	●	●	●	●
Engineering/scientific/ 2-D CAD	●	●	○	○
Desktop publishing	●	●	○	○
3-D graphics	●	●	○	○
Office productivity	●	●	○	○

station LX than you will for all the other platforms we tested combined. CAD programs to look for include Grafpak from Advanced Technology Center, ConceptStation from Aries Technology, CADD5 from Computervision, Open Image from JTS Computer Systems Ltd., and Anvil-5000 from Manufacturing and Consulting Services.

High-end relational SQL databases (Adabas, Accell/SQL, Ingres, Oracle, and Sybase) can be found residing on the SPARCstation LX, where they perform much faster than they do on Macs and equally as fast as they do on Pentium-based PCs. You'll also find some expensive high-performance publishing systems (DynaText, FrameMaker, Interleaf 5, and Ventura Publisher), scientific statistical programs such as SAS, and plenty of languages such as Allegro Common Lisp, ObjectWorks/C++, and Saber-C. There is even multimedia software such as Clarity's Rapport for the Sun. What

HOW TO SCREAM & STILL MAKE SENSE

Tseng Lab's new W32 graphics accelerator doesn't just provide brute power.

Unlike other graphics accelerators, the W32 screams through Windows as fast as you can handle it—without

getting in the way of your processor's power requirements. That means you can accelerate memory-to-screen transfers by as much as 400%!

We do it by using sophisticated memory control hardware in our chip, maximizing the interface between the SuperVGA controller and its memory. That doesn't just speed up your Windows; it also gives you the fastest DOS screen access available. In fact, no other accelerator can make everything move faster—whether you're

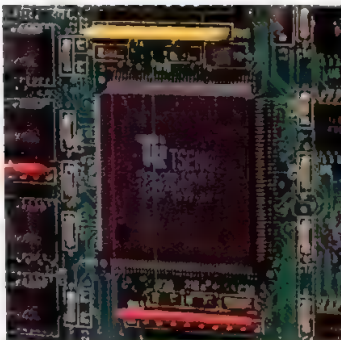


VRAM-based solutions in the dust: Zippy DOS. Snappy graphics. And the dexterity and flexibility to take on demanding multimedia programs... all based on economical DRAM power.

Yet even with all these features, the W32 is still a sensible accelerator that lets you use the comfortable old software

you've grown to love. Because the W32 is completely compatible with the industry standard ET4000 architecture, you can just plug it in and play it.

So go ahead: put your pedal to the metal and scream away. With Tseng Lab's W32 accelerator, it simply makes sense.



Your system screams with Tseng's W32.

in DOS or Windows, running an old or a new program.

By freeing up your CPU, the W32 can also help your system perform amazing feats... like displaying realistic, full-motion video.

But most importantly, the W32 does it all with DRAM—and gives you performance that leaves many



Get surprising power for your money.

For ISA or other W32 based graphics accelerators, contact:

DFI
7 Elkins Road
East Brunswick, NJ 08816
(908) 390-2815
FAX (908) 390-2817

Hercules Computer Technology, Inc.
3839 Spinnaker Court
Fremont, CA 94538
(510) 623-6030
FAX (510) 623-1112

Raritan Computer, Inc.
10-1 Ilene Court
Belle Mead, NJ 08502
(908) 874-4072
FAX (908) 874-5274

Focus Information Systems (2theMAX)
A TNC Industrial Company
4046 Clipper Court
Fremont, CA 94538
(510) 657-2845
FAX (510) 657-4158

STB Systems, Inc.
1651 North Glenville, Suite 210
Richardson, TX 75087-0957
(214) 234-8750
FAX (214) 234-1360

TSENG LABS, INC.
6 Terry Drive, Newtown, PA 18940
215-968-0502 • FAX 215-860-7713

Save Disk Space

PKZIP

PKZIP version 2.0

PC WORLD



WORLD CLASS AWARD

"PKZIP is the undisputed champion of data compression" - BYTE Magazine

"It [PKZIP] combines blazing decompression times and excellent compression speed" - PC Magazine

PKWARE introduces the next generation of its award winning compression utility, giving even greater performance levels than achieved with previous releases of the software. PKZIP compresses and archives files, saving disk space and reducing file transfer time.

Software developers, you can significantly reduce product duplication costs by decreasing the number of disks required to distribute your applications. Call for Distribution License information.

Put Your Executables on a Diet

PKLITE increases your valuable disk space by compressing executable (.EXE and .COM) files by an average of 45%. The operation of PKLITE is transparent, all you will notice is more available disk space!



Software Developers, save disk space and media costs with smaller executables. You can distribute your software in a compressed form with PKLITE Professional. PKLITE Professional also gives you the ability to compress files so that they cannot be expanded, hindering reverse engineering of your programs.

PKWARE INC.

9025 N. Deerwood Drive Brown Deer, WI 53223
(414) 354-8699 Fax (414) 354-8559

PKZIP \$47.00 PKLITE \$46.00 PKLITE Professional \$146.00
Please add \$3.50 S&H per package in the US & Canada, \$5.00 overseas.
Wisconsin residents add 5% state sales tax & applicable county sales tax.
Visa and Mastercard accepted, no COD orders.

PC-E/93

COVER STORY *The New PCs*

you won't find are the 50 word processing, two dozen spreadsheet, and hundreds of other applications we all take for granted on our PCs and Macs.

CONCLUSIONS

Because of the continued slow migration of mainstream office productivity software, the Sun SPARCstation LX is generally a poor choice for basic business desktop computing. It was also a mediocre performer at the tasks we tested in this roundup. PC folk might buy a SPARCstation LX primarily to run engineering and scientific applications, including CAD and solids modeling, high-end text processing, and relational

The SPARCstation LX

*also makes a good
server, thanks to its
excellent PC
connectivity and
networking tools.*

databases. They might, however, be better advised to spend more money and get better performance from the other Unix workstations tested. High-end graphics applications are a better reason to buy a SPARCstation LX.

You will also discover that SPARCstation LXs (and the related SPARCstations) make good file servers, thanks to their excellent PC connectivity and networking tools. But a Sun workstation, perhaps more than any of the other Unix boxes we tested, requires a serious commitment to its own proprietary Ethernet operating system. This is a commitment that most PC owners are ill-equipped to make.

Although a SPARCstation LX can run some of what you'd consider "mainstream business applications," such as Lotus 1-2-3, Improv, and WordPerfect, you wouldn't want to waste a Sun on such basic business computing tasks. You might, however, run these applications on a SPARCstation LX as an adjunct to its primary purpose. □

HP LaserJet 4

600 dpi

- PCL standard
- Adobe PostScript software optional
- 8 ppm printing speed
- 11.7"H x 16.4"W x 15.9"D
- Weight: 35 lbs.



TI microLaser PS17

300 dpi

- PCL and Adobe PostScript software std.
- Easy to use front control panel
- 9 ppm printing speed
- 10.9"H x 13.4"W x 14.2"D
- Weight: 30 lbs.



BY THE WAY,
OURS ALSO HAS
POSTSCRIPT,
MORE SPEED AND
IS EASY TO USE.

TI vs. HP.

Both offer advanced graphics capabilities. Superior flexibility with type. Superior paper handling. And more.

But there's one expensive difference. TI microLaser™ PS17 lists for over \$500 less than the HP LaserJet® 4.

Better still, TI microLaser PS17 comes standard with the industry graphics preference, PostScript® software from Adobe®. HP LaserJet 4 doesn't. We print 9 pages per minute, they print 8.

We're also easy to use with all of your major software programs, including Word®, WordPerfect®, Excel®, Lotus® 1-2-3® and Windows®.

TI microLaser PS17. It can extend your reach without over-extending your budget. For information and a dealer near you, call 1-800-527-3500.



POSTSCRIPT™
Software From Adobe

"Extending Your Reach With Innovation" and microLaser are trademarks of Texas Instruments. LaserJet is a registered trademark of Hewlett-Packard, Inc. Word, WordPerfect and Windows are registered trademarks of Microsoft Corp. Lotus and 1-2-3 are registered trademarks of Lotus Development Corp. WordPerfect is a registered trademark of WordPerfect Corp. Adobe PostScript and the PostScript logo are registered trademarks of Adobe Systems, Inc. © 1983 TI

EXTENDING YOUR REACH
WITH INNOVATION™

 **TEXAS
INSTRUMENTS**

CIRCLE 353 ON READER SERVICE CARD

SAMSUNG



SyncMaster 5c

A KLEE IT'S NOT. BUT WHO NEEDS BIG DOTS.

In CAD/CAM work, or even desktop publishing, resolution is critical. But it's not even half of the story.

So when we made our 17" screen flat, we went to considerable expense to virtually eliminate geometric distortion. Our super-fast refresh rate makes the image sharper. And our Invar Shadow Mask makes colors brighter and crisper.

Ergonomically, its anti-glare coating

and flicker-free design reduce eye-strain and fatigue. The onboard microprocessor stores up to twelve modes. And you can switch between two active video cards. All from the front panel.

Reliability is ensured by meeting the rigid new ISO 9001 standards. Something you'd expect from the

world's largest monitor manufacturer.

So there's little wonder that we've won just about every major award in the industry. Like CRN's Benchmark and VAR Business awards. What is a wonder is that it sells for about forty percent less than the high price alternative. Ever price a Klee?

Call 800 933-4110 for more information and the dealer nearest you.



SyncMaster 5c	CRT 17" Flat Screen Invar Shadow Mask	Dot Pitch: 2.0mm	Resolution: 1280x1024	Compatibility: VGA SVGA DVI S-Video CAM/DAI
---------------	--	------------------	-----------------------	--

CIRCLE 046 ON READER SERVICE CARD



ELECTRONICS

PREVIEW: WINDOWS NT

The Power Under the Hood

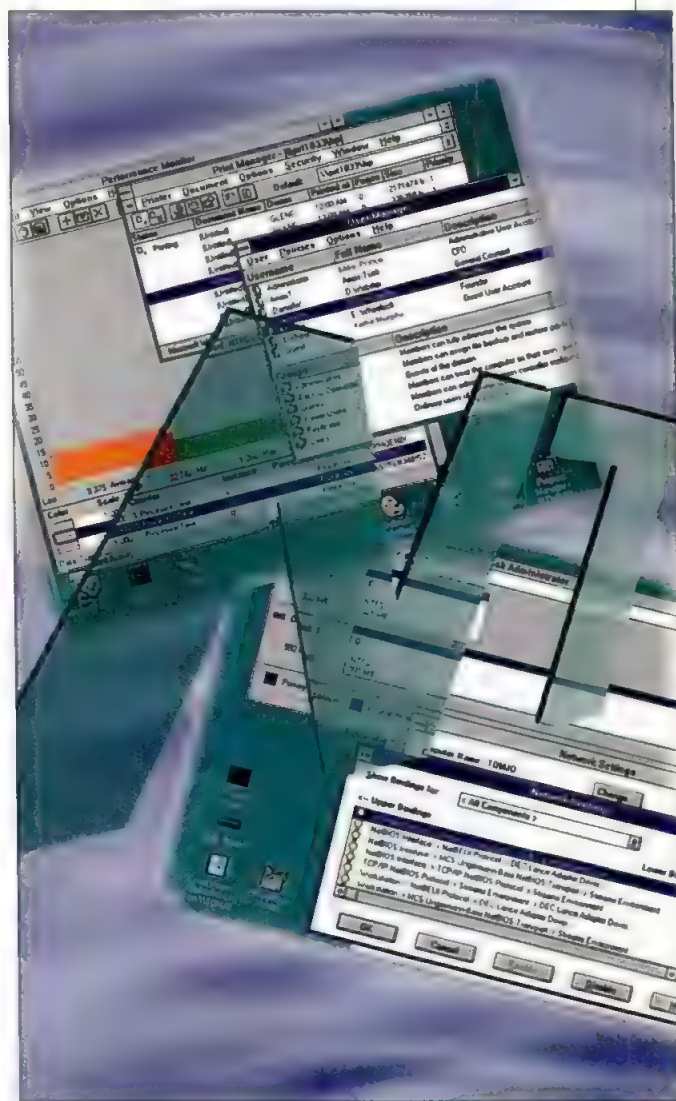
Windows NT, the first 32-bit Windows, combines the familiar Windows interface with some powerful new under-the-skin architecture.

It looks like Windows 3.1, it acts like Windows 3.1, but it's ever so much more. In fact, it may be more of an operating system than you need. It's Microsoft Windows NT, Version 3.1, and it combines familiar appearances with new features, power, and speed.

Windows NT boasts 32-bit operations, built-in networking capabilities, and intrinsic security features—making it a serious contender in business and government environments. Completely reengineered and leaving its DOS roots behind, Windows is a serious challenger for a “next-generation” operating system.

But how does this affect you? Do you need this kind of horsepower? How costly will the time and hardware investment be? How does Windows NT stack up against its 32-bit competitors, Unix and OS/2 2.1? Because Windows NT is such an important and complex product, we're providing an in-depth preview of its features to help you decide whether the time to make your next operating system move is now.

Windows NT provides a variety of new features, be-



by Ben Ezzell

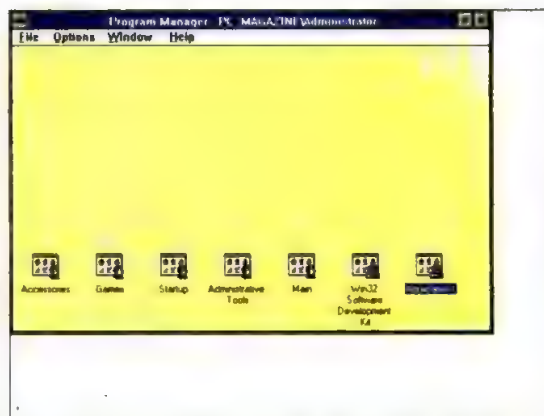
ginning with true 32-bit operations and including preemptive multitasking, multithreading, multiprocessor support, operating platform portability, networking, POSIX support, and improved security and data protection. Which features are most important may be determined by your priorities.

THE 32-BIT HURDLE

If speed or the ability to handle large blocks of data lead your wish list, Windows NT's 32-bit capabilities will make a major impression. DOS and Microsoft Windows 3.1 use 16-bit instructions and pass data in 16-bit chunks. Windows NT uses 32-bit instructions and passes data 32 bits at a time, markedly improving performance. Windows 3.1 sits on top of DOS; Windows NT completely replaces the DOS operating system.

A 32-bit operating system achieves its increased performance by removing the memory-addressing bottleneck that has plagued DOS for years. Early 16-bit systems could address memory up to 64K but could not accommodate larger arrays of memory.

To get around the 64K limit, a new addressing scheme that combined a 4-bit segment address with a 16-bit offset produced the so-called segment:offset addressing scheme, which raised address limits from 64K to 1MB. Solutions such as EMS and XMS memory handlers that address high memory beyond 1MB—but only indirectly, through driver utilities—slow operations and are, at



NT's Program Manager shows common and private program groups. Shared groups are noted by the computer icon.

best, only Band-Aids to an inherently limited system.

Windows NT abandons the awkward 20-bit segment:offset scheme and EMS/

HIGHLIGHTS

Microsoft Windows NT

TRUE 32-BIT OPERATIONS Windows NT passes data in 32-bit chunks, directly addressing up to 4GB of RAM—no file swapping, no speed penalties, and no limits on data-segment sizes.

PREEMPTIVE MULTITASKING AND MULTITHREADING An efficient traffic cop, Windows NT juggles system resources among and within applications as needed. Even Windows 3.1 and DOS applications run within a virtual session under Windows NT. With the protected-mode environment, each application executes in an isolated, individual system and cannot access memory beyond its allotment. Multithreading lets an application split tasks into subtasks (threads) for speed and efficiency.

MULTIPROCESSOR SUPPORT Not widely practical yet, this capability will be a boon for multitaskers.

SPEED, WITH SERIOUS RESOURCE DEMANDS Early indications are that Windows NT is fast, but speed and power come at a price. Windows NT needs a minimum 8MB of RAM (16MB is recommended); a 486 ma-

chine is highly recommended, and a full installation requires 70MB.

CROSS-PLATFORM PORTABILITY More efficient than most ports, Windows NT was designed with hardware-independent function layers and deals directly with the hardware platform only in very specific tasks. In addition to PCs, other anticipated platforms include Macs and various high-end workstations. Well-behaved applications that write to the subsystem and system services (not the hardware) can be recompiled and moved across platforms.

BETTER MEMORY AND FILE SYSTEM Windows NT can access more memory more efficiently, thanks to 32-bit operations and the new NTFS (New Technology File System), which handles long file names and nontraditional datatypes. NTFS handles huge storage media and throws in POSIX support and facilities for fault tolerance and file recovery.

INTEGRATED NETWORKING Networking is routinely and easily installed with the rest of the operating system (OS), and operation is virtually transparent.

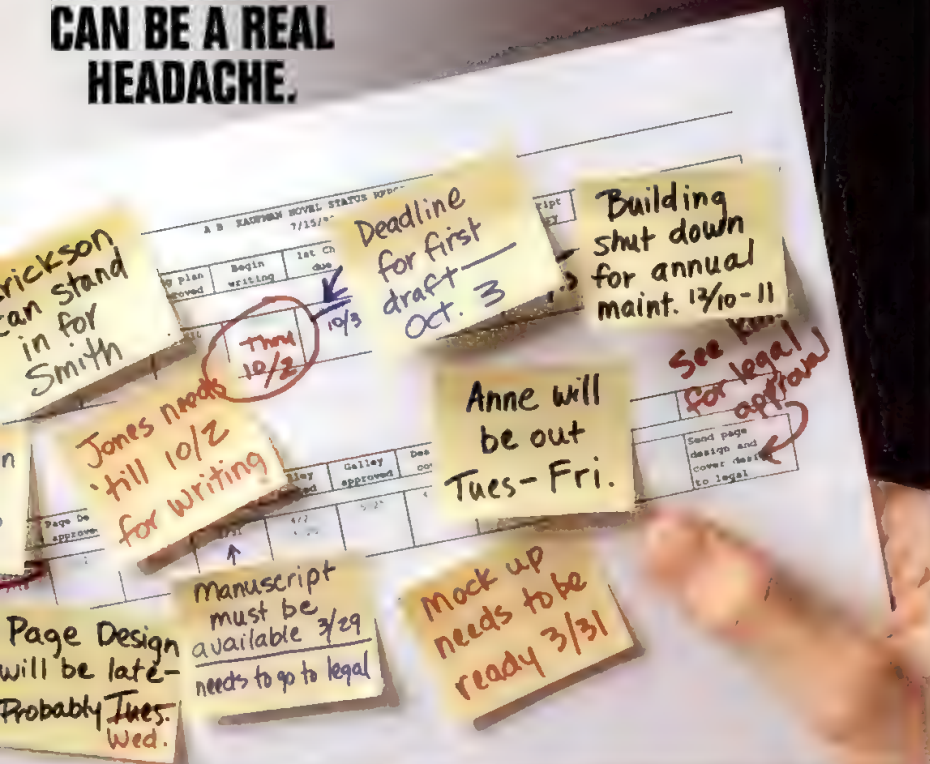
This is what operating system networking should have been like all along.

BUILT-IN SECURITY This is a logical accompaniment to the integrated networking. NT provides a log-on facility even for single-user systems and allows multiple users of the same hardware to customize their interfaces. The OS provides backup functions, fault tolerance, and recovery. To satisfy government customers, it supports POSIX and C2 security levels as well. Windows NT Advanced Server, due out shortly, provides additional features for sophisticated client-server applications.

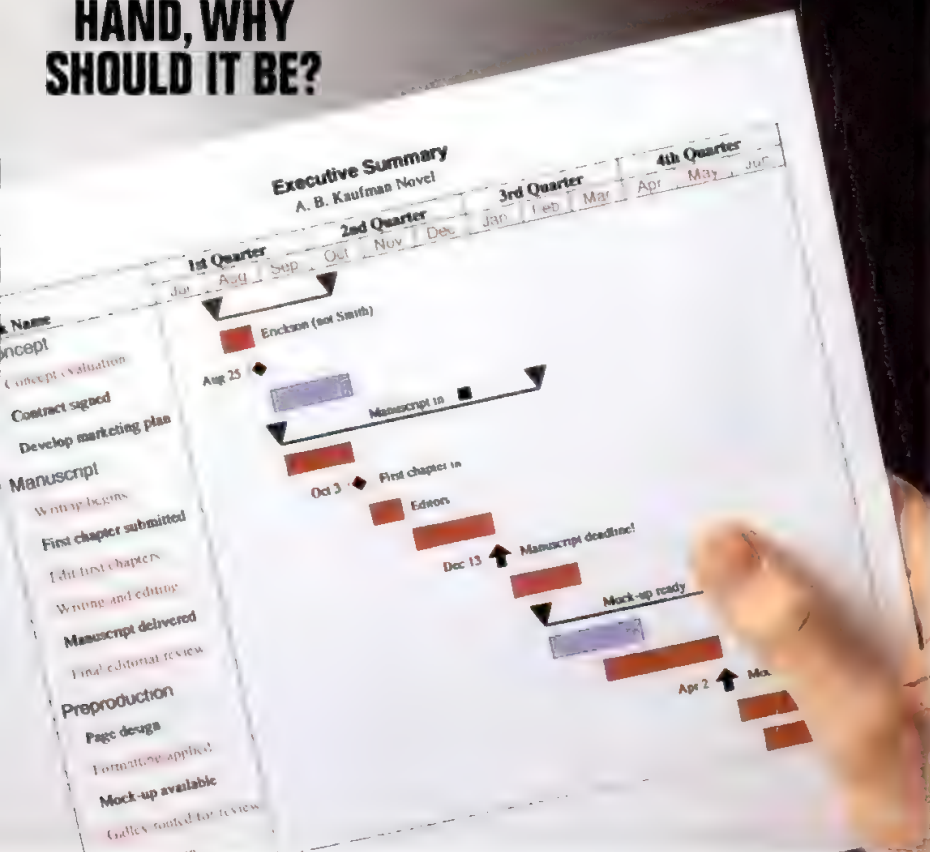
STRUCTURED EXCEPTION HANDLING This makes programmers' lives easier by replacing tedious test processes with simpler structures that flag errors and problematic events.

FAMILIARITY It looks like Windows, it acts like Windows... only it's more powerful. You don't have to learn a new way to work, and (almost) all of your familiar programs work the same as before. You can tailor your interface to your liking, share some applications, and keep others private.

ON ONE HAND, PROJECT MANAGEMENT CAN BE A REAL HEADACHE.



ON THE OTHER HAND, WHY SHOULD IT BE?



You work hard enough planning your projects; why not let Microsoft® Project 3.0 for Windows™ help you make it easier?

With clear graphs, you'll be able to see and communicate your project even better—from the tiny details to the big picture.

Changes? No problem. For every revision you make, Microsoft Project helps you see how it will affect the entire job.

Assigning a new job? Just click the People button. Want to know who's doing what, when? Microsoft Project can help you keep track of everyone.

And if you need to get off to a fast start, use PlanningWizards to guide you step by step. Soon, you'll have great-looking, easy-to-read reports that make all your plans perfectly clear.

You can even exchange files between Microsoft Project on your PC and your Mac®. Either way, why not plan on the leading project management software? Microsoft Project 3.0 – it takes the pain out of planning.

Microsoft
Making it easier

Windows NT

XMS drivers in favor of a flat 32-bit memory-address system. It's "flat" because no offset or swapping is necessary; the 32-bit instructions are direct, and can address up to 4 gigabytes (GB) of RAM. Arrays of data can be as large as available memory. You can't even install 4GB on current systems, but such a capability is not unforeseeable.

Windows NT is not the first operating system to provide 32-bit operations; Unix and OS/2 version 2.x are based on 32-bit systems. (For more information on these operating systems, see "Unix on Intel: The Beast Turns Beauty" and "OS/2 2.1: IBM's Challenger Revisited") that appear in this issue.

Our Contributors: BEN EZZELL is a Colorado-based free-lance systems analyst and programmer as well as the author of more than a dozen books on computer programming, including the forthcoming *PC Magazine Windows NT Programming*, *PC Magazine Windows NT Graphics Programming* and *PC Magazine User's Guide to Windows NT*.

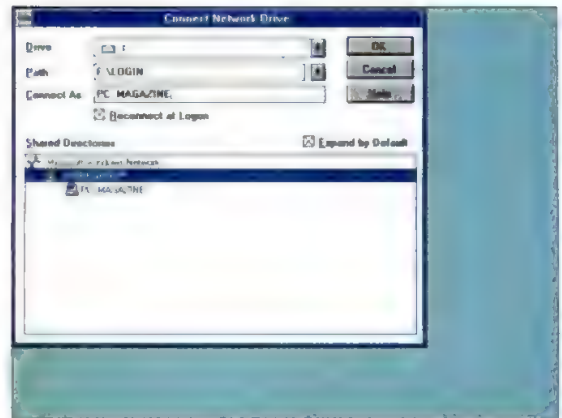
THE IMPORTANCE OF WIN32

Anyone familiar with Windows 3.1 will feel right at home in the Windows NT environment. The mouse clicks, menus, icons, desktop tools, and accessories are all available. And, Windows NT is backward compatible with existing DOS and Windows 16-bit applications. Conversely, Windows 32-bit apps will run on existing Windows 3.1 systems. The compatibility is handled by multiple subsystems, each residing as a separate process within the Windows NT architecture.

For instance, within Windows NT a virtual memory subsystem, called a VDM or Virtual DOS machine, runs 16-bit Windows (this 16-bit subsystem is referred to as WOW—Windows on Windows) and DOS applications. Windows apps run in a single VDM; DOS apps each get their own VDM. Multiple VDMs can run at once. An OS/2 subsystem can run OS/2 character-based appli-

cations in single sessions, and a POSIX subsystem runs POSIX-compliant apps.

We found that a few DOS and Windows 3.x applications—such as Micrografix's PhotoFinish, an image editor, and TouchStone Software Corp.'s CheckIt, a test utility, both of which attempt direct disk access—do not execute under NT. Most often, compatibility fails when applications try to control hardware di-

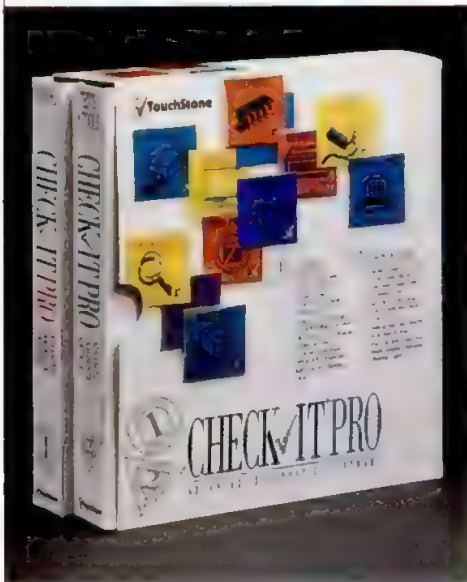


From the File Manager, you can connect to and disconnect from any networked drive.

ANNOUNCING

The Only Diagnostic That's Even Better than **CheckIt**:

CHECK-IT PRO 
ADVANCED DIAGNOSTIC SOFTWARE



Check/It PRO: SysInfo and Tests & Tools establish a new standard of excellence in PC troubleshooting utilities. No other program has ever offered such comprehensive System Information, advanced Diagnostic Tests, or flexible System Setup Tools. Combined with powerful new options for automating test and setup scripts, data reporting, and custom user procedures, we think it will be a long time before any other program even tries.

- Hardware Diagnostic Tests: System Board, Memory, Hard Drives, Floppy Drives, Video & Monitor, Serial/Parallel Ports, and Peripheral Devices
- Automated Quick Test, Test Everything, Burn-In Test, Certification, & Create "Rescue Disk"
- Optional mouse-driven menu interface or command-style "applets" for use in customized procedures
- Universal (MFM, RLL, ESDI, SCSI, IDE) Hard Drive Formatter
- Polymorphic Virus Scan (2,000+ signatures)
- DOS Media (HD, FD) Test
- Built-In Technical Reference Library

*Corporations, Dealers, Manufacturers:
Use it YOUR Way*

Check/It PRO: Tests & Tools is NOT just for use on PCs that need repairs, and it's NOT just for use by technicians. We designed our new product so that it can be used in a variety of diagnostic testing and setup applications. For example, save time by running Check/It PRO QuickTest to expedite calls for maintenance; or save money by using the interactive tests to isolate faulty components and complete the repair process. Save on future problems by using Check/It PRO Burn-In to eliminate new equipment failures, prepare Certificates to show systems are working correctly after they've been moved, modified, or repaired, and create a personal Rescue Disk for each system. It's time to get with the PROgram!



TouchStone
Software Corporation
2130 Main Street, Suite 250
Huntington Beach, CA 92648
Fax (714) 960-1886

(800) 531-0450 or (714) 969-7746

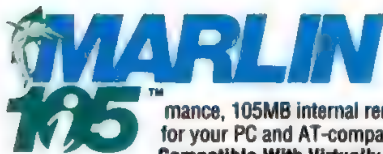
Copyright © 1993 TouchStone Software. ALL RIGHTS RESERVED. CheckIt is a trademark of TouchStone Software Corp. Huntington Beach, CA

SYDOS TURNS THE COMPETITION INSIDE.....OUT



Introducing SyDOS Marlin 105i and PUMA 105

The First 3.5" High Performance INTERNAL And EXTERNAL 105MB Removable Cartridge Disk Drives!



Marlin 105i - What A Catch! The Marlin 105i gives you all the benefits of a compact, high-performance, 105MB internal removable cartridge disk drive for your PC and AT-compatible computer.

Compatible With Virtually All AT-Type Systems. The

Marlin 105i comes complete with 105MB data cartridge, 16-bit IDE Host Adapter, easy Windows™-like installation software, cables, manuals and mounting brackets for installation in any 5.25" or 3.5" computer bay, giving you maximum flexibility. And, the **Marlin 105i** can co-reside with other fixed drives and peripherals operating from MFM, ESDI, SCSI, RLL or IDE adapters.

Fast Performance. The **Marlin 105i** is designed around proven Winchester technology that provides you storage in 105MB increments. The cartridges are so small that they can fit in your shirt pocket! And, with an access time of 14.5 msec, the **Marlin 105i** gives you the performance and reliability you find in fixed drives.

Unlimited Capacity. There is no limit to capacity using the **Marlin 105i** drive, because there is no limit to the number of 105MB cartridges you can use. Cartridge technology eliminates your every storage constraint. So, whatever your storage requirements — data security, data organization, data transportability, or backup — you will never run out of storage space. Just pop in another 105 MB cartridge!

Plug Into The Power Of PUMA. The first truly portable 105MB external removable cartridge disk drive. Now you can capture the faster, high-performance and greater capacity of a portable storage solution.

Maximum Portability. With all of the performance and unlimited storage features of the Marlin 105i, the **PUMA 105** external is your answer to portable storage. The **PUMA 105** has a convenient handle built into its compact case for easy carrying. Plus, the compact 3.5" data cartridge is small enough to fit in your shirt pocket. So, if one of your many computing requirements is backup, the **PUMA 105** is your answer. Just carry it from computer to computer.

Easy Installation. **PUMA 105** drives have been designed for fast easy installation to the parallel port of virtually any DOS or Windows-based desktop, notebook or laptop system. In addition to the parallel port adapter, the **PUMA 105** comes with a printer "pass-thru" to allow simultaneous connection of the drive and a printer to the same parallel port. Just plug the **PUMA 105** in, run the easy-to-use Windows-like software, and in seconds you are up-and-running.

Optional Battery Pack. SyDOS offers an optional battery pack which allows up to five hours of use with the **PUMA 105**, providing maximum portability.

So, whether you are considering an **INTERNAL** or **EXTERNAL** removable disk drive, consider the Marlin 105i or the PUMA 105 by SyDOS, the leader in removable mass storage solutions.

Fixed Drive Performance - The Marlin 105i and PUMA 105 use proven Winchester technology and achieve access times of 14.5 msec, the same type of performance found in fixed disk drives.

Removability Second To None - The compact 3.5" 105MB removable SyQuest data cartridges are ideal for data organization, transportability, unlimited storage, backup and data security. SyDOS removable drives are the all-in-one solution to your every computing need.

Superior Performance To Tape - SyDOS 105MB removable cartridge disk drives perform backup faster than tape — you can back up 105 megabytes in as little as five minutes. When you need the information, just insert your cartridge and data is readily available. No time is wasted restoring archived tape files.

Superior Performance To Optical - The use of Winchester technology allows the SyDOS drives to achieve access times of 14.5 msec. That is hard-drive performance, three times faster than optical.

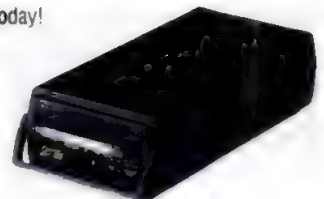
Higher Reliability Than Floppies - SyDOS drives utilize SyQuest technology — the #1 removable cartridge product, with over 800,000 installations and 3 million cartridges in use worldwide. SyDOS drives use hard-disk platters, while floppy-based systems utilize flexible media, which gradually wear from constant flexing.

Unsurpassed Warranty - Both drives come with an unsurpassed warranty — two years on the drive and five years on the cartridge. And, you can reach our Customer Support Team toll-free at 1-800-536-7936.

Call Today - To find out how you can reel in a Marlin 105i, or snare a PUMA 105, call 1-800-43SYDOS today!



SyDOS™
(A Division of SyQuest Technology)



6501 Park of Commerce, Suite 110, Boca Raton, Florida 33487 (407) 998-5400 FAX (407) 998-5414 1-800-43SYDOS

*SyDOS, MARLIN and PUMA are trademarks of SyQuest Technology

CIRCLE 279 ON READER SERVICE CARD

*Windows is a trademark of Microsoft Corporation

▪ The NT Development Arena

by Ben Ezzell

Microsoft Windows NT resembles Windows 3.1, but the environment requires a new suite of programming tools. A number of development packages are appearing.

The only fully market-ready Windows NT compiler is Microsoft's Software Development Kit (SDK) for Windows NT. The package consists of a 32-bit version of the Microsoft C/C++ command-line compiler with resource-development editors for the typical lineup of graphical tools: dialog boxes, menus, image resources (cursors, bitmaps, and icons), and a font editor. Microsoft's SDK also provides a porting tool to help convert Windows 3.1 applications to Windows NT, and includes debug facilities and on-line documentation of NT API functions. The SDK supplies compiler versions for both PC and MIPS systems.

Borland International's C/C++ Integrated Development Environment (IDE) compiler and Resource Workshop—a mainstay with many Windows 3.1 developers—are being developed in full 32-bit versions for use with Windows NT. Beta versions of both the IDE and the Resource Workshop function in essentially the same fashion as their 16-bit predecessors. Borland estimates a midsummer shipment of the full 32-bit package.

Windows NT's use of structured exception handling—an architectural provision that simplifies the code designed to respond to abnormal circumstances or errors—is a long-overdue blessing. Exception handling can replace lengthy test processes with simpler structures and responses. Programmers will first notice two keywords, *try* and *except*, which are both new to the Windows NT compilers from Borland and Microsoft. Borland's compilers will supply true C++ exception handling rather than the macro-based exception handling pro-

vided by the Microsoft compiler. Also, the Borland 32-bit compiler offers full template support—an important feature for developers whose previous work is template-based and who want to move the applications to the Windows NT environment with minimal disruption. Borland will also supply a new version of Object Windows Li-

If you are a dedicated Microsoft SDK user, take heart: The new 32-bit tools have not changed markedly from their 16-bit predecessors.

brary (OWL), supporting both 16- and 32-bit systems, for its C/C++ compilers.

Compiler and toolkit improvements and enhancements aside, developing the majority of Windows NT applications is essentially the same as developing Windows 3.1 applications. And conversion from Windows 3.1 to Windows NT is relatively simple.

If you're a dedicated Microsoft SDK user, take heart: The new 32-bit tools have not changed markedly from their 16-bit predecessors, and the 32-bit command-line compiler works almost exactly as in earlier versions. If you prefer Borland's IDE and Resource Workshop, you face a few immediate disruptions until Borland ships its 32-bit implementations. The hassles are minimal, because you can still use the current 16-bit Borland Resource Workshop to develop application resources. One major difference in the 32-Bit Resource Workshop is that it cannot compile application resources as .RES resource files, but instead must create .RC resource scripts.

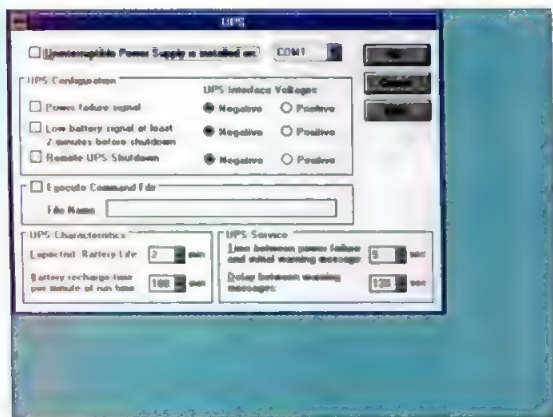
Borland's 16-bit IDE cannot be used to compile, test, or debug 32-bit Windows NT applications, although the editor features can still be used to write programs. For the moment, you'll need to compile using either Borland's or Microsoft's command-line compilers and use their make facilities to compile and link the application.

Similar to the Borland product, Microsoft's new Visual C/C++ compiler is a 16-bit compiler that can be used as an editor and resource developer even though it cannot directly compile or test 32-bit NT apps.

Both the Microsoft and Borland C/C++ command-line compilers provide code examples and sample applications for Windows NT. For now, compiling and linking developed applications requires either of the compilers and a make file with instructions. But as Windows NT is implemented, fully functional development tools will readily become available.

Thousands of Windows NT applications are in development, including nearly 200 tool/development/compiler packages. Many are already available in prerelease versions. Among the upcoming tools are ported products from current Windows developers and new packages from such familiar companies as Blue Sky Software, DEC, Symantec Corp., Watcom, and Zinc Software.

The MSWIN32 Forum on CompuServe, Library 16, contains a TOOLTX.ZIP file listing Windows NT tools from hundreds of developers. The file is available for downloading in a variety of word processing formats. It uses multicolumn indexes and fills hundreds of pages once printed. It is also available in the Windows NT SDK. Another developers' directory is available directly from Microsoft. You may obtain it by writing for The 32-bit Application Guide, c/o Microsoft Corp. Systems Marketing, One Microsoft Way, Redmond, WA 98052. □



The UPS Service works with a UPS hardware device to warn users of power failures and manage safe system shutdowns.

rectly, such as memory or CPU registers, instead of operating through DOS interrupt calls or Windows 3.x API calls.

To assure that future 32-bit applications will run on existing Windows 3.1 systems, Microsoft developed the Win32s subsystem. Win32s is the 32-bit API that runs on top of Windows NT and operates 32-bit applications. A subset of this API, called Win32s (s is for subset) can run on top of enhanced-mode Windows 3.1. The Win32s subsystem can take an EXE built for Win32 and run it unchanged under Windows 3.1, minus certain Windows NT-specific characteristics such as preemptive multitasking, Bezier curves, and C2 security. In other words, it runs what it can and ignores the rest. VXDs and DLLs necessary to run Win32s will be distributed with 32-bit applications.

MULTITASKED, -THREADED, AND -PROCESSED

True preemptive multitasking is one of the most significant improvements over Windows 3.1. All versions of Windows support an early form of multitasking, which allows more than one application to operate at a time, but previous implementations have been "cooperative" rather than preemptive. Cooperative execution means that an application takes control of both the operating system and the hardware, then (eventually) passes along that control to the next application. This works as long as applications are well-behaved; one application wandering off into some lengthy process of its own can tie up the entire system, however.

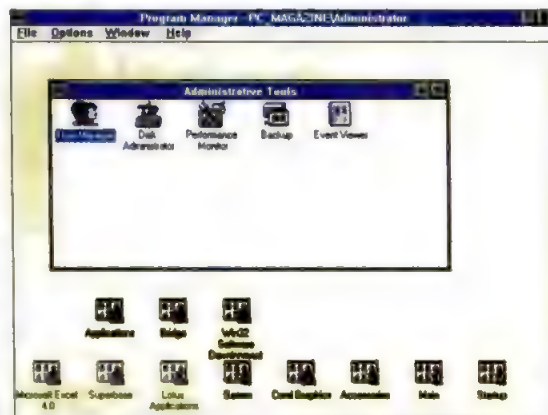
The solution, as implemented by Win-

dows NT, is preemptive multitasking. Much like Unix and OS/2, Windows NT schedules operations among applications, giving each a slice of time with the CPU and system resources. When an application's turn is up, Windows NT suspends the application's operations but saves its status, and restores that status when the application's turn comes again. Individual applications are effectively unaware of the interruptions, but no single application, no matter how badly behaved, can hog the system resources. Also, because Windows NT runs in protected mode, each application gets its own memory area, into which other applications are not able to intrude.

Windows NT also supports multithreading, which lets applications divide tasks into two

or more subtasks. Each subtask gets a separate thread of CPU operations; the threads execute concurrently. Multithreading offers an advantage, even on single CPUs. Writing SQL queries for information from a database (perhaps on a remote machine), for example, utilizes multithreading by executing queries concurrently instead of sequentially.

Out on the cutting edge, Windows NT's support for symmetric multipro-



The Administrative tool group includes tools that handle user rights, partitioning of disks, performance monitoring, and backup.

PS/2 Processor Upgrades... **NEW!**

- 486 upgrades for Models 70 & 80
- 386 upgrades for Models 50, 50z & 60

33 MHz Speed! Zero-Slot Solution!

Call 800-446-4525 or fax 603-526-6915 to order.

Sigma Data
INCORPORATED
NEW LONDON, NH

**Model 70
Slotless
Hard
Drive
213, 340,
535 Mb**



The NT Architecture

Microsoft Windows NT has a modular architecture comprised of different subsystems. On center stage is the Win32 subsystem, which provides Windows NT with its user interface and acts as a controller calling the appropriate subsystem for each application. There are subsystems for running OS/2 applications, POSIX-compliant applications, and a VDM (Virtual DOS machine) for running MS-DOS as well as 16-bit Windows applications.

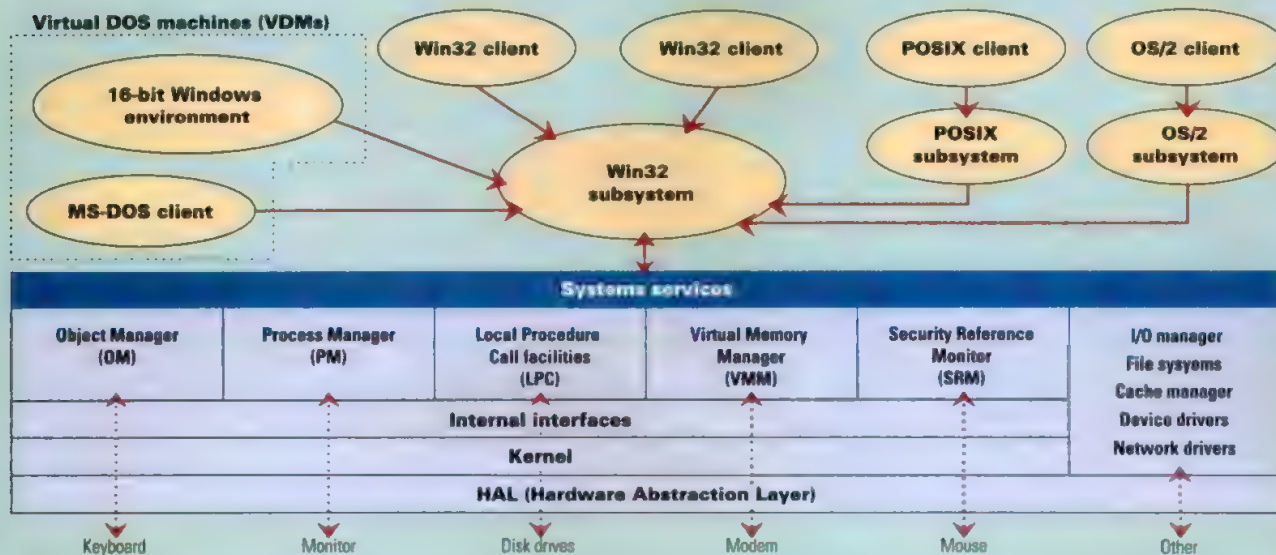
At Windows NT's core, a small kernel provides basic operations: allocating and synchronizing multiple processors, handling interrupts and error exceptions, and scheduling threads. The kernel provides the basic objects and interface routines used by the various levels of the NT Executive, which manages the interface between the kernel and the various subsystems.

The I/O Manager handles device-independent input/output facilities; the File Systems consist of NT drivers that translate file I/O requests into device-specific I/O requests to the FAT, NTFS, HPFS, or network file system. NT treats file systems as device drivers, allowing them to be dynamically loaded. The I/O Manager consists of four principal services: the File Systems, Cache Manager, Device Drivers, and Network Drivers. The Cache Manager buffers file I/O operations using the Virtual Memory Manager's (VMM) paging facility. The device drivers are low-level drivers that handle the actual hardware I/O; the network driver is a system driver that handles network communications requests by transmitting data to and receiving data from the other systems.

Other Systems services include the

OM, which creates and manages NT Executive objects—abstract datatypes, such as an icon's position or a dialog box that represent operating system resources. The PM creates and terminates process threads. The LPC facilities handle messages between client and server processes on the same machine. It is similar to Remote Procedure Call (RPC) facilities used in network client-server processes. The VMM manages memory and protects each memory allocation from encroachment from other processes and applications. The SRM controls file access, guards system resources, and audits access requests.

The HAL, the lowest level of the Windows NT architecture, is system-specific and provides a translation layer between the NT Executive and the physical platform running NT. All NT Executive operations occur by calling functions in the HAL, which respond as appropriate for the platform.—BE



cessing allows an application to run on any free processor in the system or on all processors simultaneously, sharing memory among them. As multiple-CPU machines become more widely and economically available, developers will understand more about harnessing this process. Initially, we can expect Windows NT to run on multiprocessor machines

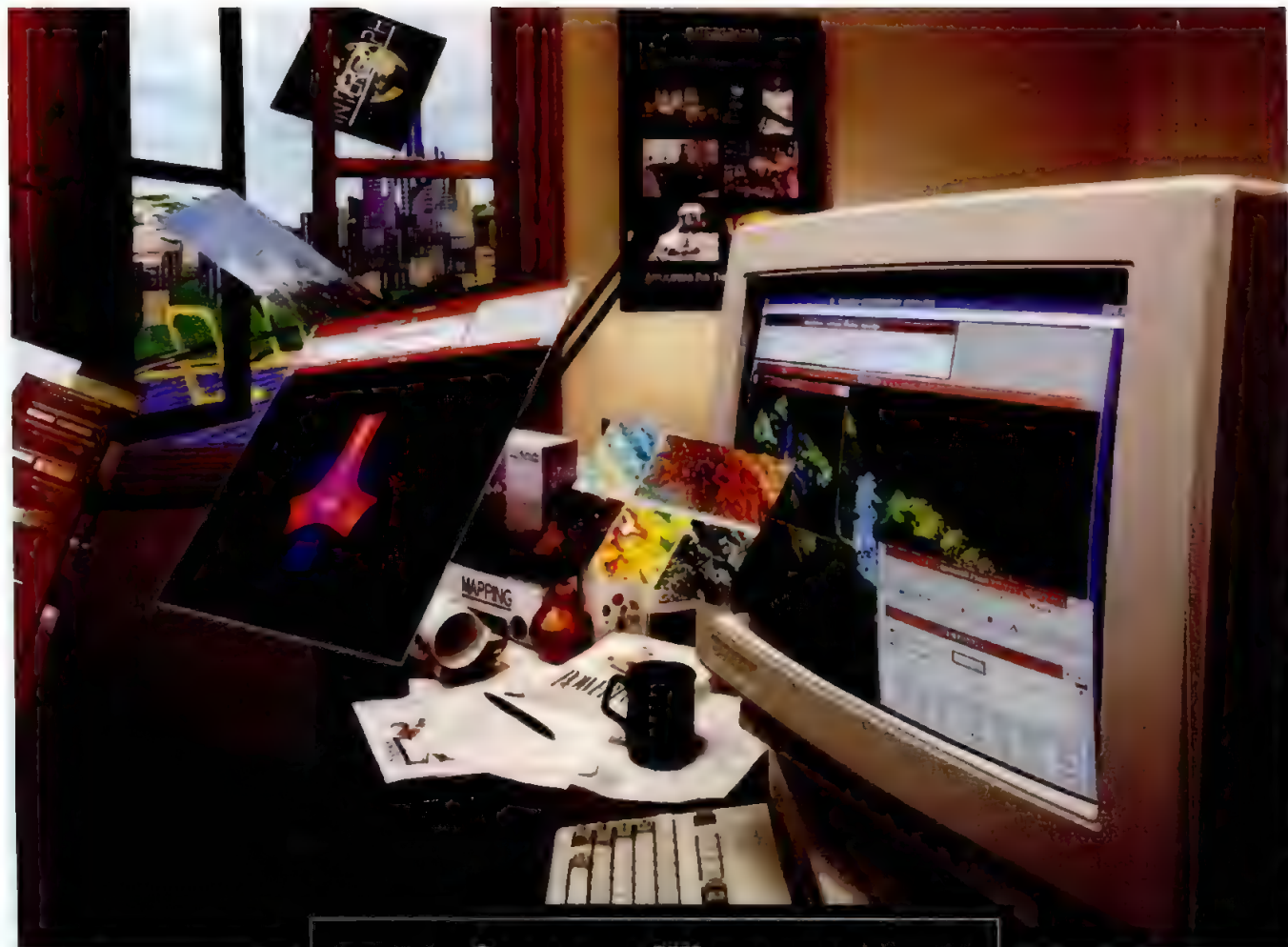
used for file servers and other high-end computing applications. Some versions of the Unix operating system support symmetrical multiprocessing, but OS/2 2.x does not provide this feature.

THE WINDOWS NT GUI

Paradoxically, the Windows NT GUI (graphical user interface) is one feature

that, despite extensive changes and improvements, is virtually indistinguishable from previous versions of Windows—Microsoft has dubbed Windows NT "Version 3.1" to emphasize its similarity to the current Windows release.

The major difference between Windows NT's GUI and the GUI in previous versions of Windows is Windows NT's pro-



OPENING WINDOWS TO A WORLD OF SOLUTIONS

In the world of Windows NT, Intergraph's applications bring a new level of power and sophistication to the technical desktop.

The computer graphics industry has made another leap forward. Under Microsoft's New Technology operating system, popular business programs and Intergraph's technical applications can run alongside each other on the same computer. The same friendly Windows environment appears throughout the applications — word processing, spreadsheets, architecture, civil engineering, mapping, and all the rest. CAD users can now spend time designing and drafting, not navigating through the operating system.

"The Microsoft-Intergraph alliance provides a full range of technical applications, as well as a wealth of personal productivity tools — complete solutions for the technical desktop."

*Paul Maritz, Microsoft
Senior Vice President of Systems*

ADVERTISEMENT

A powerhouse of features gives you the productivity edge!

MicroStation offers more functionality in one package than any other CAD software. New *dimension-driven design* options help you design intelligently using geometric and dimensional constraints. Apply variables to the constraints and save your design for reuse with different parameters when creating similar objects or parts. These and more new capabilities—like user-defined linestyles and associative patterning and hatching—provide the most complete drafting environment available.

Powerful tools help you create freeform, mathematically precise surface models. Model virtually any object, no matter how complex. Perform trim, blend, fillet, and Boolean operations between surfaces. You've got the simplicity of solid modeling without the overhead.

Visualizing your designs is easy and cost-effective with MicroStation's new photorealistic rendering capabilities. Light sources, shadows, transparencies, depth cueing, anti-aliasing, and bump and pattern mapping help you market your designs. You can even create flythrough animations and play them onscreen for your clients. MicroStation is a powerhouse of features in one package.

The best tool for the '90s production environment.

Users value the way MicroStation performs in the production environment. On large projects, it's a clean-running, fast performer. One user said, "MicroStation is an all-encompassing system ... capable of covering all facets of project management, not just design and drafting."

MicroStation users enhance productivity through real-time data sharing. True file referencing allows each member of a workgroup to easily

RENDER



MicroStation Version 5
reads and writes to
AutoCAD .dwg format.

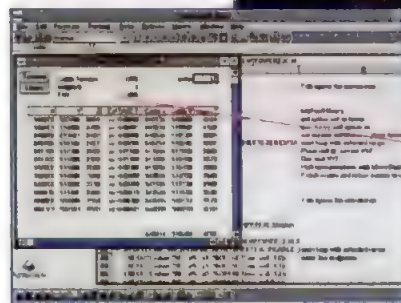
"Compared to DataCAD, AutoCAD, and
VersaCAD, MicroStation is much faster ..."
Computer-Aided
Engineering

and safely share files concurrently with others. It's peer-to-peer sharing of design information while everyone continues working—across multiple hardware platforms and networks.

Run MicroStation with other Windows applications. Cut and paste graphics in a Word proposal. Link document text with your MicroStation design file. Drive MicroStation graphics with an Excel spreadsheet. Embed sounds and messages in your design file.

MicroStation

All in all, if you combine MicroStation's integration capabilities with Windows' data sharing capabilities, you've got just what you'd expect from a '90s CAD product. And you have a clear growth path to Intergraph's sophisticated application solutions for UNIX and Windows NT.



COMPUTER-AIDED ENGINEERING

ADVERTISEMENT



MicroStation is general-purpose CAD software that runs on

PCs, Macs, and UNIX workstations. It is a primary tool in Intergraph's solutions for the technical desktop. If you appreciate the economy of PCs but need sophisticated design power, take a look at MicroStation. It means a more productive, more profitable future for you and your company.

CAD

should give you the productivity edge you need to be competitive

in today's business environment. You need a tool that streamlines the process of drafting,

as well as a modeler that helps you create virtually

"MicroStation includes a robust set of 3D capabilities and gives you a variety of ways to render models."

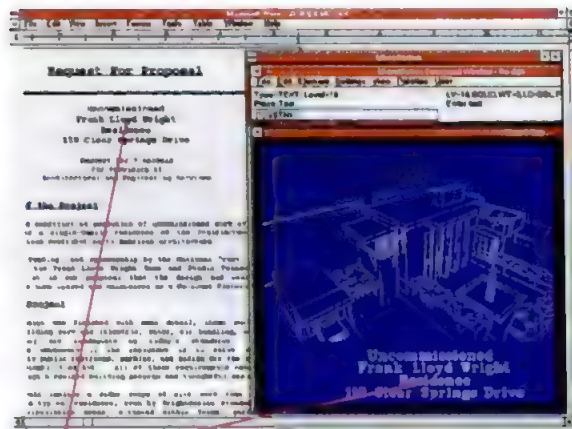
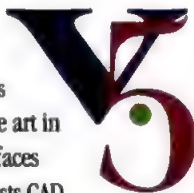
Infoworld

any object — fast. You should be able to store design data in relational databases without programming. Your future depends on the ability to share data

with your design team and other operations. MicroStation software gives its users this level of proficiency. And keeps them in tune with the best in applications solutions.

Intergraph introduces MicroStation Version 5. It refines a product that is considered the state of the art in CAD graphical user interfaces (GUI). In doing so it boosts CAD to a higher level of usability.

MicroStation Version 5 brings renowned integration advantages to designers and



LINK TEXT

engineers who need to run in the Microsoft Windows business environment — Windows, Windows for Workgroups, and Windows NT.

Software that puts you in charge.

Today, *user friendly* means more than easy — it means software that empowers you. You control MicroStation through a graphical command center featuring icon command buttons ... pull-down menus ... tear-away palettes ... multiple, resizable overlapping views. The display is sleek. With no perceptible repaint, Version 5's graphical user interface seems to float over your drafting and design area.

MicroStation runs as an extension of the way you work. Choose from unique *Workspaces* designed for your profession. They configure the graphical CAD desktop for you and manage the computing environment to your needs. Even discipline-specific drafting *styles* are provided. And it's all tailorable: Graphically build your own pull-down menus and palettes. Rearrange fields in dialog boxes. Disengage commands. You've got the power to create the interface that best meets the needs of the task at hand.

CAD software should accommodate the way you think, work, learn — even change your mind. You should be able to select a different dimensioning system right in the middle of a command. Or modify a shape and have

MicroStation integrates with your favorite Windows business applications.



MicroStation PC is an exceptionally usable, powerful package with such rare and exotic features as nonuniform rational B-splines."

PC Magazine

all of the dimensions automatically change. Simple actions — like grabbing a line or object — should be so fast that they require no conscious effort. MicroStation performs functions like these as a matter of course. Other CAD software simply can't.



Store information in popular relational databases — without programming!



Beyond the immediate benefits, there are advantages that come from Intergraph's years of experience. In some industries, 25 years is not much. In computer graphics, 25 years is the lifetime of the industry. For almost a quarter of a century, Intergraph has developed computer graphics systems — hardware, software, and support — for industries that rely heavily on maps, engineering drawings, and models to convey information.



*Gobbell Hays
Partners Inc.
a 32-person firm.*

uses MicroStation and ModelView from Intergraph to design laboratories for corporations and universities. Says firm president Ronald Gobbell, "Three-dimensional modeling shows the scientist exactly how his lab is going to look." With MicroStation, Gobbell Hays can customize and reuse cells with symbols of equipment, cabinets, and other basic lab features.

The Intergraph advantage.

The arrival of a powerful new Windows operating environment means that for the first time, hundreds of thousands of microCAD users will have access to the functionality and technical sophistication of Intergraph applications.

Long-term partnerships with customers worldwide.

Intergraph's reputation for top-notch customer service follows the company around the globe as international business steadily increases. Intergraph's extensive customer support network

continues to earn top ratings in customer satisfaction surveys. The most recent Daratech *Industry Update* quotes a wide range of

Intergraph users range from small offices or departments to large multinational firms, and their projects run the gamut from single drawings to complex aircraft carriers.

Intergraph users satisfied with their systems. Intergraph's track record of technological stability and continuity is important:

"Intergraph has given me a competitive advantage for a number of years."

"No other vendor could have given us total binary file compatibility for all these years."

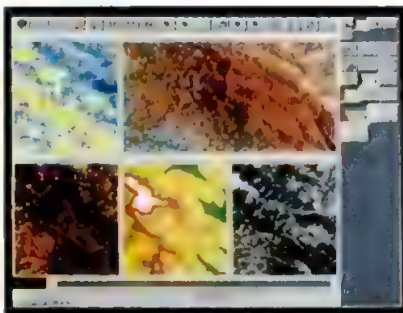
"I'm a firm believer that they have the best CAD product on the market."

*Daratech Industry Update
November 1992*

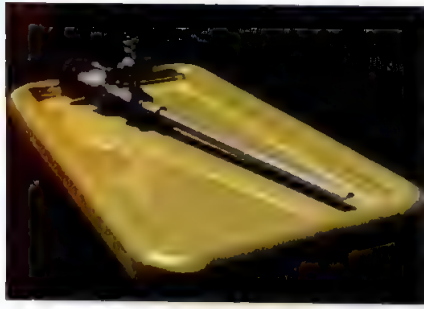
Ole OLE

Integrate CAD processing with other Windows applications such as Word and Excel by taking advantage of complete support for Microsoft's Object Linking and Embedding (OLE) technology.

With Intergraph's MGE geographic information system, California's Division of Mines and Geology will provide digital maps to enable Californians to determine if they live in risky earthquake or landslide zones.



Linvalec Corporation uses the high-performance solid modeling technology in Intergraph's Engineering Modeling System (EMS) to design products for least invasive surgery. The process of identifying and developing new and innovative products is



fundamental for growth in the health care industry, and Linvalec credits Intergraph systems for providing a strong competitive edge.

NT

Intergraph is the world's largest independent development site for Windows NT applications.

Technical leadership.

The list of disciplines addressed with Intergraph software is one of the longest in the industry — and continues to grow.

- Aeronautical charting • Architecture
- Cartography • Civil engineering • Dispatch management • Document management
- Electronics design • Energy exploration
- Environmental resource management
- Facilities management • Geographic information systems • Image processing
- Industrial design • Manufacturing
- Mechanical engineering • Photogrammetry
- Plant design • Publishing • Ship design
- Surveying • Telecommunications • Urban planning • Utilities — gas, electric, water



In 39 of the 50 departments of transportation in the United States, Intergraph applications for surveying, civil engineering, and GIS enable the DOTs to design and maintain the nation's transportation infrastructure.

New opportunities arise when you go with the CAD standard.

MicroStation can give you a foot in the door on major projects around the world. For example, the U.S. Army Corps of Engineers and their subcontractors use MicroStation-based applications. On the massive Hong Kong airport project, Intergraph has been named CAD supplier in the four contracts announced so far. Through numerous contractors and subcontractors, Intergraph applications will play a major role in designing and building the new airport and township, as well as the railway that connects them to Kowloon and Hong Kong.

Designed for Windows NT — the new Technical Desktop Series workstations.

Intergraph has traditionally supplied complete software and hardware solutions. In keeping with this tradition, Intergraph offers its own systems designed for Windows NT. They're optimized for CAD immediately out of the box, with full networking capabilities built-in. So it's simply plug-and-play. And with an Intergraph workstation, display clarity, high resolution, and graphics performance make viewing your work a pleasure.

These fast, affordable systems are perfect for running the new technical applications from Intergraph, along with thousands of other applications that run under Windows. And workstations in the Technical Desktop Series are fully interoperable with other systems on your network.

Low-cost suite of AEC applications

Feature-packed and available at a low cost, Intergraph's MasterWorks applications for architects and civil engineers bring a new level of power and value to the technical desktop. Intergraph brings to the Windows world functions formerly available only in high-end CAD systems. The MasterWorks series includes these applications:

- RoadWorks — transportation engineering
- DesignWorks — architectural design
- CogoWorks — coordinate geometry
- FrameWorks — structural modeling
- SiteWorks — site design

Whatever your project, MasterWorks will empower you to master your design challenges.

Affordable, expandable geographic information systems (GIS)

With the Modular GIS Environment (MGE) solutions for the PC, Intergraph gives you the best of both worlds — the power of the world's leading GIS on the world's most popular computing platform. Using MGE PC solutions, you can build an integrated, powerful GIS without investing large amounts of time, money, or resources. Start with a single PC and add workstations and sophisticated software as your needs grow. Or expand your existing MGE network with cost-effective PC seats. MGE PC solutions include:

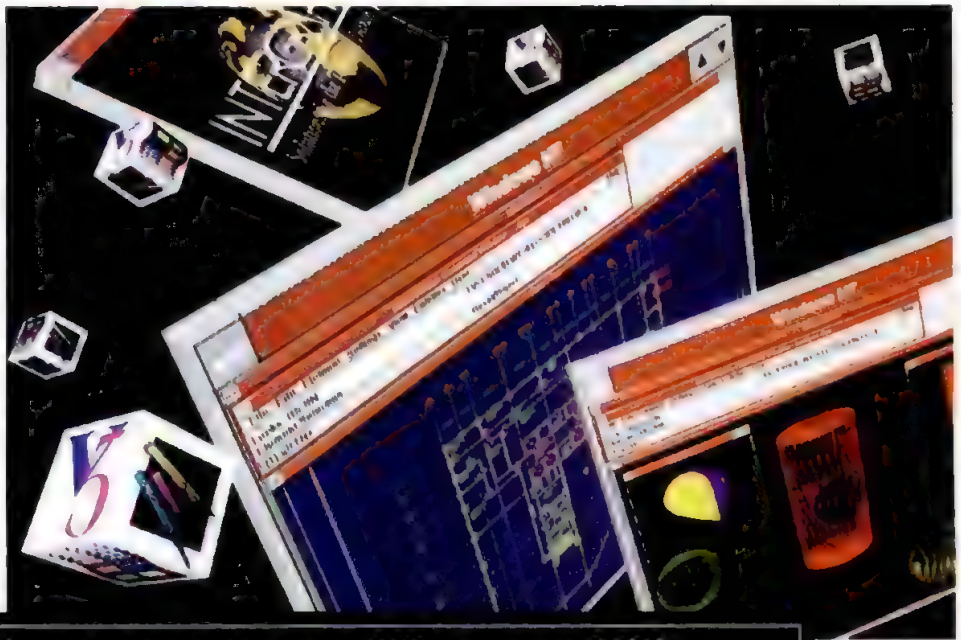
- MGE PC-1 — database creation and project management
- MGE Grid Analyst PC — spatial modeling and analysis
- MapInfo for Windows — desktop thematic mapping
- MGE Project Viewer — read-only database display and query



ADVERTISEMENT

Before you spend a dollar, look at the value of your investment. You can be highly productive with MicroStation's powerhouse of features for only \$3,790 –

CALL 800-345-4856 today for an Intergraph Solution Center reseller or sales representative in your area.



APPLICATIONS FOR WINDOWS NT

Innovative technology – once the domain of high-end systems – is now available on the technical desktop. For a more productive future, this is what you need . . .

Workgroup integration.

Intergraph pioneered reference files, the technology that enables each member of a workgroup to easily share designs with others. And, since .dwg files can also be referenced, you can work with AutoCAD-created data in MicroStation. In the Intergraph distributed computing environment, you share information, printers, plotters, and storage devices – and see dramatic savings in time and money.

Integrated applications.

Intergraph's integrated data management architecture provides access to technical information within applications and across disciplines. This means that Intergraph's applications can address an entire project workflow from end to end. Access to information across disciplines is made even easier by the fact that all applications feature the same easy-to-learn-and-use graphical user interface.

Smooth operation between operating systems.

Many of Intergraph's customers operate on networks that include a mixture of workstations and PCs, so interoperability is essential. Because Intergraph application file formats are common across hardware platforms, there are no problems of data incompatibility or translation, and sharing data is easy. Also, basic Windows NT includes all the tools needed for TCP/IP communication with our UNIX-based systems, so users can mix UNIX-based and Windows NT-based workstations in their networks and enjoy smooth interoperability.

Relational database support.

Intergraph data management tools feature built-in interfaces to Oracle, Informix, and other database management products. This support of leading databases in multiple environments enables you to create links to them without programming.

Growth path.

If you choose to upgrade your hardware or add other high-end technical applications, Intergraph gives you a growth path. You can upgrade your system and continue to share files.

Open systems and industry standards.

Your investment in hardware and software is protected by Intergraph's continuing support of major standards for computing, networking, drafting, and design.

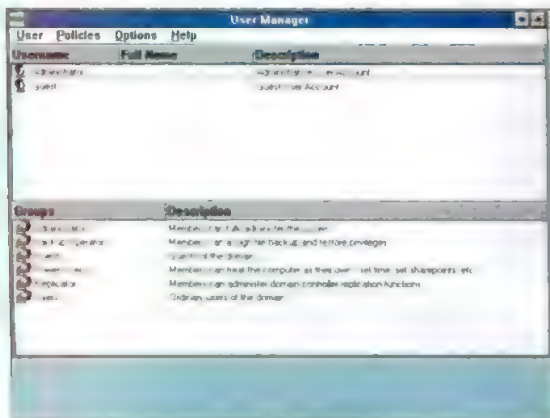
Value-added services.

Intergraph also provides support in the form of project implementation, customization, systems integration, training, and worldwide service and maintenance.

Call 800-345-4856 for an Intergraph sales representative in your area.

INTERGRAPH
Solutions for the Technical Desktop

Windows NT



The User Manager shows a list of user accounts, together with the groups to which each belong. You can drill down for detail.

gram group icons, which appear in two different forms to identify common and private program groups. All users logged onto the system have common program groups. Private program groups may belong to a specific user or to users with access privileges. Only users with system administrator privileges can access the Administration group, for example.

Another, less apparent difference is that any user can tailor the GUI and other specifications of Windows NT.

When a user logs on to Windows NT, the operating environment retrieves his or her personal environmental settings, which include such preferences as color, wallpaper, mouse settings, keyboard (language) drivers, and personal program groups. Multiple settings for a single user are permitted.

One of the more striking differences between Windows NT and other Microsoft operating environments is that the familiar Ctrl-Alt-Del sequence does not reset the system as in DOS, or close an offending application as in Windows 3.1.

In Windows NT, Ctrl-Alt-Del pops up a window and prompts you for your password. This is intended to prevent a Trojan horse virus from trying to intercept your password.

Another Windows NT change concerns the Windows 3.1 Clipboard; in Windows NT, the Clipboard is augmented with a ClipBook, capable of housing multiple images and also capable of being

shared on the network. And of course, OLE (Object Linking and Embedding—still Version 1.0) is fully integrated into Windows NT.

A NETWORKING VIEW

Windows NT and networking are inextricably tied. NT includes basic peer-to-peer network services that support file copying, e-mail, and device sharing. In addition, Windows NT can establish connections with existing network systems such as Banyan's VINES, Novell's NetWare, Sun NFS, and Microsoft Windows for Workgroups.

In keeping with the modular organization, network services run in a protected subsystem within the NT environment. NT includes a variety of APIs that allow you to connect, transfer data, and browse across the network. APIs include: NetBIOS (providing backward compatibility with DOS, Win16, and OS/2, as well as a new 32-bit NetBIOS), Sockets (a Unix-style interface), Win32 I/O (for remote machines) and Win32 network (to browse NT network resources). Win32's named pipe and mailslot API expedites LAN connections and broadcast mes-

The Microsoft Family of Operating Systems

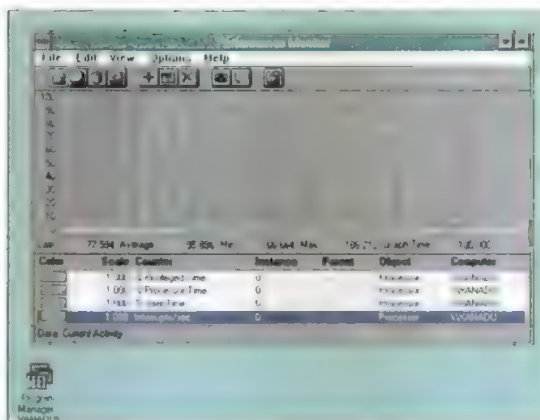
Microsoft offers five different operating environments. Even though the Windows environments look similar, the evolution from Windows 3.1 to Windows NT Advanced Server involves some fundamental shifts.

	MS-DOS	Microsoft Windows 3.1	Microsoft Windows for Workgroups	Microsoft Windows NT	Microsoft Windows NT Advanced Server
User interface	Character-based	Graphics windows	Graphics windows	Graphics windows	Graphics windows
File system	FAT	FAT	FAT	FAT or NTFS	FAT or NTFS
Address space	16-bit segmented	16-bit segmented or 32-bit flat (using Win32s)	16-bit segmented or 32-bit flat (using Win32s)	32-bit flat	32-bit flat
Multitasking model	None	Cooperative	Cooperative	Preemptive	Preemptive
Network support	None	Drivers for popular NOSs	Peer-to-peer	Integrated file and print sharing, named pipes, RPC, industry-standard transports	Same as NT, plus remote-access Macintosh clients, single log-on to enterprise for all clients
Hardware platform	Intel 8088 or better	Intel 286 or better	Intel 286 or better	Intel 386 or better, DEC Alpha, MIPS R4000	Intel 386 or better, DEC Alpha, MIPS R4000
Multimedia	None	MCI, MIDI, sound	MCI, MIDI, sound	MCI, MIDI, sound	MCI, MIDI, sound
Security	None	None	Share-level	C2-level, maintained per system	C2-level, maintained per enterprise
Multiprocessor support	None	None	None	Symmetric	Symmetric
Fault tolerance	None	None	None	Transaction-based file system with NTFS and UPS support; tape backup	Same as NT, plus disk striping, with parity (RAID), drive duplexing, disk mirroring

sages, and an RPC (remote procedure call) API provides a full client-server environment. Finally, there's an XPlatform API to connect to Mac and mainframe networks.

To support the networking features, Windows NT includes a number of new tools. The Network icon on the Control Panel lets you join a workgroup as easily as you might add a new printer driver. The Server icon lets you view connected and shared resources. The Control Panel adds a System control to configure system environment parameters such as the path and include directories, a Services control to maintain and control system services such as event logging, and a UPS (uninterruptible power supply) control to install and configure connections to an intelligent UPS system.

Those who need even more robust, enterprise-wide networking—specifically, the ability to join multiple do-



The Performance Monitor tracks how system resources are being used, showing each resource type in color.

mains—will need Windows NT Advanced Server. A complement to Windows NT, Advanced Server will be available shortly after NT ships. It will offer full client-server operations in addition to existing peer-to-peer operations.

Features include a host of fault-tolerance additions, including disk mirroring, duplexing and striping with parity, distributed naming database facilities, multithreaded server support, and mixed-platform support for connections between PCs, Macs, and MIPS systems. We'll be looking at Advanced Server facilities in upcoming issues.

Familiarizing yourself with NT's networking features will be relatively easy if you use either or both of the two full-size groupware apps included in NT. Microsoft Mail is a complete e-mail package; Microsoft Schedule+ is a network calendar and scheduler. Both are well integrated into NT. The mail application includes both client and server components and has the ability to pass "rich" messages containing objects

■ NT Tips and Troubleshooting

Read before taking the NT plunge:

Choosing a File System For now, we strongly recommend installing Windows NT in a dual-boot configuration. If you retain a 16-bit option, you can make sure your favorite DOS or Windows 3.1 applications aren't among the few that won't run under NT. Also, Windows NT doesn't support drivers for many popular tape backup systems. Backup operations may need to be performed under 16-bit DOS. NT's Boot Loader option makes it easy to boot either DOS or NT as desired. When you use Boot Loader, you can boot NT from any drive or partition—not just from the C: drive, as in DOS. If you switch to the NTFS (New Technology File System) but still want dual-boot capability, do not make the C: drive an NTFS partition. Reserve drive C:—with the 16-bit FAT file system—for DOS and Windows 3.1. Designate the **last** drive on your system an NTFS volume. Any NTFS drive(s) will be invisible when DOS is booted, but if these

partitions come last, the remaining drive designations will be constant, regardless of which OS you've selected.

Ctrl-Alt-Del It doesn't mean "escape" anymore. Under Windows NT, Ctrl-Alt-Del summons the Windows NT Security dialog box which lets you either terminate any application or log off.

Log-on When you first boot Windows NT, a dialog box prompts you to enter the Ctrl-Alt-Del combination. A second dialog box requests your name, domain, and password. The initial Ctrl-Alt-Del combination is a measure to prevent a Trojan horse virus program from presenting a false log-on screen and intercepting your real password. When you do log off, you'll find yourself back at the Ctrl-Alt-Del prompt . . . and, this time, you can press the reset button or shut the system down.

System Boot Tests Don't worry about running CHKDSK or other media tests. Windows NT performs extensive media

tests during boot-up and during operation, and it includes hot-fix support for bad sectors. During boot-up, Windows NT automatically tests for file errors and recovers any lost clusters.

Disaster Recovery Windows NT can prevent data loss resulting from power interruptions. Upon reboot, Windows NT automatically recovers any lost clusters as numbered files in a numbered subdirectory. You can recover any usable data from those.

The Event Viewer/System Log Use the Event Viewer/System Log in the Administrative Tools group to help you track down mysterious malfunctions. The Event Viewer is not limited to malfunctions, but keeps a record of more mundane tasks, such as print jobs and audit requests.

Network Adapters/Drivers Although initial support for network cards is limited, Windows NT supplies drivers for



Imagine getting this kind of thrill from a PC.

You remember the day they opened the Twister and tickets were half price. You stood in line. You removed all loose jewelry. You sat back and looked at the sky as you ratcheted up the highest vertical drop in the world. You screamed, "I'm gonna die!"

You never felt so alive. And you've been on a quest for speed ever since.





6 full-size ISA slots

give you room
for plenty of options

Compact design

Everything fits into a
17" x 7" x 17" micro-tower
enclosure

"Holds more in less space"

- PC Magazine, April 13 1993

Network certified

Every DECpc MT is tested and
certified compatible with Novell™,
NetWare™ and Digital
PATHWORKS™



**Autosensing 260W
power supply**

Ample power for options, with a very quiet
variable speed fan

Local bus video and GUI accelerator

Windows fly open. Applications switch instantly
If you're a pixel, it's the only way to fly



Wait'll you climb into the new 486-powered DECpc

3 processor choices

Hz i486DX - DECpc 433dx MT
Hz i486DX2 - DECpc 450d2 MT
Hz i486DX2 - DECpc 466d2 MT

Ergonomic styling

allows convenient access to horizontal front accessible drive bays

Low emission SVGA monitors

in 4 sizes (14"-19")
comply with the most exacting international standards.



Hold on to your hat. The DECpc™ MT is priced like a clone, but it runs like a cyclone. The Windows performance will leave you breathless. The extra features and sleek footprint will floor you. Even the low price may make you a little dizzy. But only for a nanosecond.

"The MT 'towers' over PCs."

— Infoworld, March 8, 1993

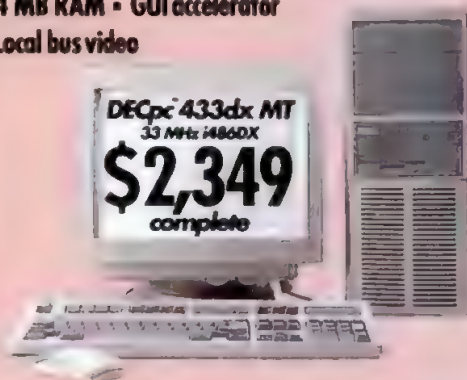
Best of all, you can get the MT from the world's fastest growing PC source: Digital. With all the world-class services you'd expect — and more: a one year on-site warranty direct from Digital, supported by 35,000 people worldwide. Support for your PC, your software, your network, *everything* — whether or not you bought it from us. Support so good, in fact, that it won PC Magazine Reader's Choice Award.

The DECpc MT is one heck of a ride. And with our outstanding support, you always know exactly where you'll end up. So go ahead. Make the call. Then take it for a spin.

Each DECpc MT gives you:

- 6 ISA slots, 5 drive bays • 127 MB hard drive
- 4 MB RAM • GUI accelerator
- Local bus video

DECpc 433dx MT
33 MHz i486DX
\$2,349
complete



CALL 1-800-332-4409

8:30 a.m. to 8:00 p.m. Mon.-Fri. ET
Please reference BAP when you call

MT.

digital

PUTTING IMAGINATION TO WORK

THE DECpc FAMILY. ONE BREATHTAKING VALUE AFTER ANOTHER.

LP SYSTEMS



Basic Features

- i486 processors
- 4 MB RAM, expandable to 64 MB
- 128 KB external cache memory, expandable to 256 KB
- Local bus video and built-in GUI accelerator
- 512 KB VRAM, expandable to 1 MB
- 127 MB IDE hard drive
- 3.5" 1.44 MB floppy disk drive
- 3 available full ISA slots
- 14" SVGA low emission non-interlaced color monitor
- MS-DOS® 6.0 and Microsoft Windows™ 3.1 installed
- 2-button mouse
- 101-key keyboard
- Low-profile enclosure (3.5" x 16.1" x 15.6")

DECpc 425sx LP

- 25 MHz i486SX

\$1,649

DECpc 433sx LP

- 33 MHz i486SX

\$1,849

DECpc 433dx LP

- 33 MHz i486DX

\$2,099

DECpc 450d2 LP

- 50 MHz i486DX2

\$2,249

DECpc 466d2 LP

- 66 MHz i486DX2

\$2,549

Lease for as low as \$74 a month.

MT SYSTEMS



Basic Features

- i486 processors
- 4 MB RAM, expandable to 64 MB
- 128 KB external cache memory, expandable to 256 KB
- Local bus video and built-in GUI accelerator
- 512 KB VRAM, expandable to 1 MB
- 127 MB IDE hard drive
- 3.5" 1.44 MB floppy disk drive
- 3 available front accessible 5.25" drive bays
- 6 available full ISA slots
- 14" SVGA low emission non-interlaced color monitor
- MS-DOS 6.0 and Microsoft Windows 3.1 installed
- 3-button mouse
- 101-key keyboard
- Compact micro-tower enclosure (17" x 7" x 17")

DECpc 433dx MT

- 33 MHz i486DX

\$2,349

DECpc 450d2 MT

- 50 MHz i486DX2

\$2,499

DECpc 466d2 MT

- 66 MHz i486DX2

\$2,799

Lease for as low as \$82 a month.



SL NOTEBOOKS



Basic Features

- i386SL and i486SL processors
- Processor upgradable
- 120 MB removable hard drive
- 3.5" 1.44 MB floppy disk drive
- Upgradable LCD screens
- Snap-on trackball
- 2 Type II PCMCIA slots
- MS-DOS, Microsoft Windows, BitFax™/BitCom™ fax/modem software installed
- 6.5 hr. NiMH battery and autosensing AC adapter
- Optional Docking Port and Docking Station
- 80-key keyboard

DECpc 325SL

- 25 MHz i386SL
- 64 KB external cache
- 4 MB RAM expandable to 20 MB
- 9.5" 64-gray supertwist screen
- Size 8.5" x 11.5" x 1.8", 5.9 lb

\$2,299

DECpc 325SLC

- 25 MHz i386SL
- 64 KB external cache
- 4 MB RAM expandable to 20 MB
- 9.5" 256-color passive matrix screen
- Size 8.5" x 11.5" x 2.1", 6.9 lb

\$2,899

DECpc 425SLC

- 25 MHz i486SL
- 8 KB internal cache
- 4 MB RAM expandable to 32 MB
- 9.5" 64-gray supertwist screen
- Size 8.5" x 11.5" x 1.8", 6.2 lb

\$2,499

DECpc 425SLC Premium

- 25 MHz i486SL
- 8 KB internal cache
- 4 MB RAM expandable to 32 MB
- 9.5" 256-color active matrix screen
- Size 8.5" x 11.5" x 2.1", 6.9 lb

\$3,999

Lease for as low as \$74 a month.

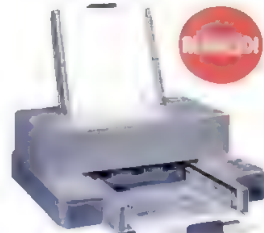
PRINTERS



DECwriter 95

- 24-wire dot matrix
- High resolution at low cost (360 x 360 dpi)
- 13 resident fonts
- Upgrades to 7-color printing

\$319



DECmultiJET 2000

- Bubble ink jet technology
- HP™ Deskjet Plus Emulation
- High resolution (300 dpi)
- Sheet feeder built-in

\$499



DECclaser 1152

- PostScript Level 2 and HP PCL4
- 17 Adobe PostScript® fonts
- Multiple simultaneous active I/O ports
- 4 pages/minute

\$1,299

Take another 10% off these low prices!

Purchase any Digital desktop printer with your DECpc and receive 10% of the price of the printer. (Offer good through 7/3/93; not applicable to Resellers.)

France 1-69 87 69 87	U.K. 0800-393200	Germany 0130-7778
Holland 030-832883	Italy 1678-02075	Canada 800-267-6215
Australia 008-021246	New Zealand 0800-800332	Asia 852-311-8321
Brazil 55-11-492-4195	Mexico 52-5-669-0422	Puerto Rico 809-781-0505 x1 8357
Venezuela 58-2-952-4011	Caribbean 305-360-6500	Japan 0120-116004

1-800-332-4409

8:30 a.m. to 8:00 p.m. Mon-Fri. ET
Please reference BAP when you call

digital™

© Digital Equipment Corporation, 1993. Digital, DECpc, DECclaser, DECmultiJET, DECwriter, PATHWORKS, and the DIGITAL logo are trademarks of Digital Equipment Corporation. HP is a registered trademark of Hewlett-Packard Company. i386, i486, and the Intel Inside logo are trademarks of Intel Corporation. PostScript is a registered trademark of Adobe Systems, Inc. Windows is a trademark and MS-DOS is a registered trademark of Microsoft Corporation. Novell and NetWare are trademarks of Novell, Inc. BitFax and BitCom are trademarks of Bit Software. Digital believes that the information in this advertisement is accurate as of its publication date; such information is subject to change without notice. Digital is not responsible for any errors. Actual monitor may differ from those shown. Not all products available worldwide.

Windows NT

and attachments as large as 32K. Schedule+ relies on the mail app to send and receive, but lets users maintain private and public or shared schedules.

Emphasis on security features naturally follows from Windows NT's focus on networking. Windows NT includes Class2- (C2) level government security standards. This is a huge step up from DOS, but the C2 level is not as secure as some of the Unix security features, which include B1 standards. Windows NT is currently involved in the formal government certification process, which is mostly of note to users in government. Windows NT implements security and access-tracking on a per-process rather than per-record basis, and checks for rights only when a user seeks file access.

ADMINISTRATIVE CLOUT

Many of the network features require administrative privileges. New administra-

tive tools include the User Manager, a tool that helps manage the creation, maintenance, and security of user accounts by providing an overview of both user-account status and user groupings on the NT workstation; the Disk Administrator, a graphical equivalent of FDISK for partitioning, creating, deleting, and managing volumes; and the Performance Monitor, a graphical tool that charts the activity of system components in use. (End users also have access to this.)

The Backup facilities emphasize network backup. Full support for tape devices, and such optimizing features as a quick erase for tapes and a retention command to eliminate loose spots on tapes are available. The Event Viewer provides constant status on specified events.



The Control Panel has some new additions to help with the Windows NT setup, including networking connections.

NTFS: DON'T DROP THE FAT

Replacing the DOS FAT (file allocation table) system is a higher-performance system called NTFS (New Technology File System). NTFS won't be evident when you boot up Windows NT, but its

NT Tips**CONTINUED**

many popular network cards, and more drivers are shipping soon. A hardware compatibility check is advisable (see next tip), however. Windows NT automatically detects network adapter cards, recognizing the card type, interrupt assignments, and other characteristics. And network printer access is easy because the network automatically recognizes the printers installed on the various nodes in the system.

Video and Tape Drivers Late beta versions of Windows NT offered limited support for high-resolution video cards and high-color resolutions. The default VGA video driver supports all video cards, and Microsoft is developing and distributing higher-resolution drivers; for now, users should carefully check video card compatibility before switching to Windows NT. The same holds true for tape backup systems. Reference lists of the latest hardware and software compatibilities are available on-line on CompuServe's MSWIN32 Forum (GO MSWIN32) Library 1, or on the MSWIN32 Forum, Library 17.

VESA Local-Bus Boards In informal testing, we found that running a VESA-standard local-bus motherboard with a compatible local-bus video card produced video speeds approximately 15 percent faster than conventional video operations. Problems surfaced, not in video performance but with failure of the NTVDM.EXE (NT Virtual Device Memory) utility. This caused failures in both the Windows 3.1 subsystem and the DOS shell. Identical failures occurred with three local-bus video cards from different manufacturers. The local-bus motherboard operated correctly only with a conventional 16-bit video card. The problem seems to be linked to certain local-bus boards and is not characteristic of VESA motherboards in general.

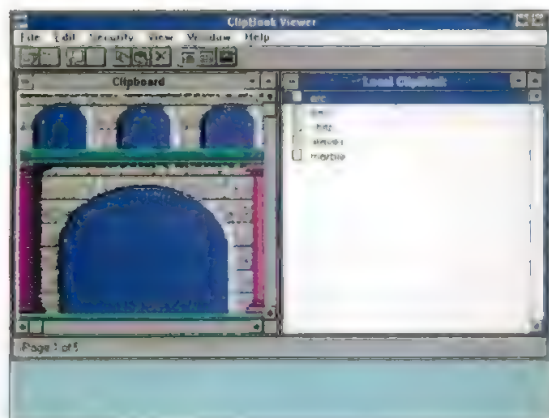
Emergency Repairs Doing things like trying to install a video driver that is incompatible with your graphics display card can cause serious problems—Windows NT may not appear when booted. During installation, create an Emergency Repair Disk that can recreate your NT system without losing the bulk of your information. First boot the NT installation disk; insert the Re-

pair Disk when prompted—the system should be restored without big losses.

Other driver/adaptor limitations Any peripheral hardware that needs custom drivers is potentially incompatible until new 32-bit drivers are available. You cannot expect existing 16-bit OEM drivers to work under Windows NT's 32-bit environment. Items to check for compatibility include sound and MIDI cards (only some are supported); printers (most are supported); CD-ROM devices (check for SCSI card compatibility with supported drivers); and non-standard mouse or pointing devices (some older mice are not supported). If your NT-incompatible CD-ROM/SCSI runs under DOS, you can still use it for installation even though it may not operate once NT is loaded. Other potential conflicts include fax cards, voice-recognition cards, camera interface cards, remote device control cards, and other specialty peripherals; most modems are accommodated.

Introducing Windows NT Windows NT's tutorial provides step-by-step instructions and illustrations for network operations. It's worth a close look.

Windows NT



The Clipboard Viewer includes the familiar Clipboard, as well as the Local Clipboard, which can be used to share data.

advantages will become apparent. For example, file and directory names can have as many as 256 characters. (The program automatically creates and stores a DOS name to ensure DOS compatibility.)

NTFS is the reason for many of the advantages of NT, such as fault tolerance, security, support for huge files, POSIX compliance, faster disk access, and support for file names of unlimited size and Unicode (international) style.

Windows NT can read and write files to the 16-bit FAT used by DOS and Windows, or to the new 32-bit NTFS. The two file systems cannot mix, however; an entire drive or partition must be formatted for use with NTFS files in order to take advantage of the new file structure. A potential disadvantage is that DOS/Windows 3.1 cannot access a NTFS volume.

Floppy drives also support only FAT files, causing at least one measure of incompatibility between DOS/Windows 3.1 and Windows NT NTFS.

At least until more Windows NT drivers for peripherals ship, the new file system complicates backup operations. Few tape drives yet support NTFS, so users may need to back up data from a hard disk partition still set up under FAT. Similarly, file-compression utilities are not yet compatible with Windows NT because they do not support the

32-bit operations. This limitation includes the DOS 6.0 file-compression utility in its initial release.

So while you can choose either to upgrade fully to Windows NT or to use the Boot Loader in Windows NT to load your choice of operating systems (at this time only NTFS and DOS are supported), we recommend the latter course. Windows NT's Boot Loader works similarly to the boot loader found in OS/2. Remember, however, that dual-boot DOS must boot from the C: partition, which must remain a FAT, not an NTFS, drive. When you use the boot loader, however, Windows NT can boot from any partition. Windows NT offers a choice of drive/partition for installation, asking you whether you want to keep the installation partition as a FAT drive or convert to the NTFS

file system. If you select conversion to NTFS, the program preserves all of the existing files. Also, regardless of which file system is used, both NTFS and FAT drives are fully accessible from within Windows NT.

As with Windows 3.1, Windows NT's Cache Manager reads ahead on the hard disk during data retrieval. It holds the extra data in memory in order to respond to the next retrieval request. In like fashion, a disk-write operation writes the data rapidly to the cache memory and then transfers it to the disk later as time permits. (The Print Manager is similar in operation but uses RAM, not cache memory.) The drawback, of course, is that data in cache memory is lost if the system is reset or if power is lost. One improvement is that NT's Cache Manager does some automatic balancing.

PORTABLE AND SCALABLE

The major difference between Windows NT's architecture and that of its predecessors is its modular design (for more information, see "The NT Architecture"). Among the most publicized (and controversial) features of Windows NT is its portability. The initial release runs not only on PCs, but also on RISC systems such as Digital's Alpha AXP, and the MIPS R4x00 (for more information, see "Workstation Platforms: Heavyweight Contenders" in this issue). To achieve this portability, Microsoft designed the operating system in levels. To port the

Operating System Highlights

Thirty-two-bit operating systems are more alike than different. We chart the key variables here. For more detail on the specifications for the various Unices and OS/2 2.1, see the stories "Unix on Intel: The Beast Turns Beauty" and "IBM's Challenge Revisited" in this issue.

	Microsoft Windows 3.1	Microsoft Windows NT	OS/2 2.1	Unix
Multitasking model	Cooperative	Preemptive	Preemptive	Preemptive
Multituser capability	No	Yes (via client server)	No	Yes
Kernel	DOS, KERNEL.EXE (protected mode)	NT Executive	OS/2 kernel	Mixed (Mach, SVR3.2, SVR4.2)
File system	FAT	FAT, HPFS, NTFS	FAT, HPFS	HPFS, S5, UFS
Symmetric multiprocessor support	No	Yes	No	Yes (NeXT, SCO, Solaris)
Security	No	Yes (C2 level)	No	Yes (B1, B2/C2 level available as modules or built-in)
Networking	No	Yes (peer and server)	Yes (server)	Yes (peer and server)
Maximum addressable memory	32MB with extended memory	4GB	512MB	4GB
Maximum theoretical file size	4GB	17 billion GB	64GB	2GB
Runs Windows 3.1 applications	Yes	Yes	Yes	No
Hardware platforms	Intel 286 or better	Intel 386 or better, DEC Alpha, MIPS	Intel 386 or better	Intel 286 or better, DEC Alpha, MIPS, Motorola 680x0, PowerPC, RISC, SPARC
Disk space required for full installation	10MB	70MB	35MB	100MB (typical installation)

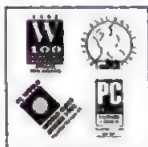


if you've
put off getting organized,
we've finally come around to
your way of thinking.

©1993 Polaris Software. Windows is a trademark of Microsoft Corporation.

The trouble with getting organized is people don't know where to start. Start with PackRat 5.0.

PackRat 5.0 is the first software to harness the power of the personal computer to integrate all the big ideas and critical details that make the difference between order and chaos in your busy day.

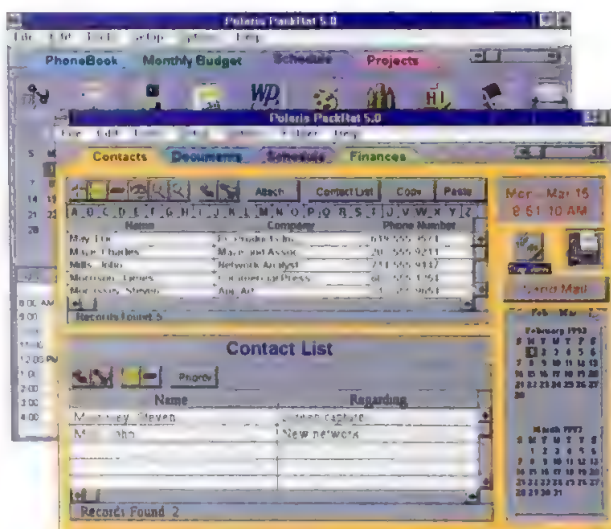


Here's how it works: Instead of your com-

puter being application driven, PackRat 5.0 makes it activity driven. Segmented in customizable file folders. Organized by your priorities. Structured the way you think and work.

PackRat becomes the hub of all PC activity, integrating

everything you do. PackRat takes charge of your phone book and calendars, your to-do lists and meeting notes, your finances and your correspondence. It will sort



Design and label folders according to your workstyle for quick, easy access to the Windows applications and tools you need most.

out schedule conflicts, dial your phone, update your priorities and issue reports. And that's just for starters.

Hey, isn't this what you got a PC for in the first place?

For a free brochure, call:

1-800-PACKRAT, x D 0 6 1

CIRCLE 108 ON READER SERVICE CARD



POLARIS
SOFTWARE

See us at Windows World Booth #W7958, COMDEX/Spring

Save Over \$1,000 In 30 Seconds.

Just take a look at the chart below. In no time at all, you'll see that CompuAdd Express packs more into their 66MHz/486DX2 system -- for less -- than the competition.

66MHz/486DX2 Comparison Chart*					
	Express	Dell	Gateway	Zeos	IBM
Memory	8M	8M	8M	8M	8M
Hard Drive	340MB	320MB	340MB	340MB	212MB
Floppy Drive	2	2	2	2	1
Monitor	14"***	14"	15"	14"	15"
DOS, Windows Mouse	Y	Y	Y	Y	Y
Application SW	Y	N	Y	Y	N
Price	\$2,495	\$3,569	\$2,995	\$2,775	\$3,119

*Prices quoted 2/3/93 **15" monitor, add \$150

There's no comparison. CompuAdd Express offers you more features and saves you more money. And that really adds up. Especially when you include our highly regarded service package. It's standard with all our systems. And it includes Remote Rescue with Close-Up 4.0 for online technical support. Plus all this: a 30-day money back guarantee, Express 30-day exchange, one-year limited warranty, one-year onsite service, rapid repairs, toll-free lifetime technical support, technical bulletin board service, the convenience of Express leasing, and easy credit when you have an Express credit card. Add it all together, and you'll agree, CompuAdd Express gives you more for less.



Express Scalable 466DX2

- i486DX2 processor rated at 66MHz (Intel clock-doubler technology)
- 340MB IDE hard drive
- 8MB RAM expandable to 32MB
- 14" non-interlaced 72Hz flicker-free HRVGA (1MB memory for 1024x768 with 256 colors)
- Local bus video
- Dual floppy drive
- Low profile chassis
- 128K cache
- One 5.25" and two 3.5" drive bays
- Three full-size, two half-size slots
- FREE Windows 3.1, MS DOS 5.0, Lotus software option, Close-Up 4.0, serial mouse
- Full profile also available, add \$100

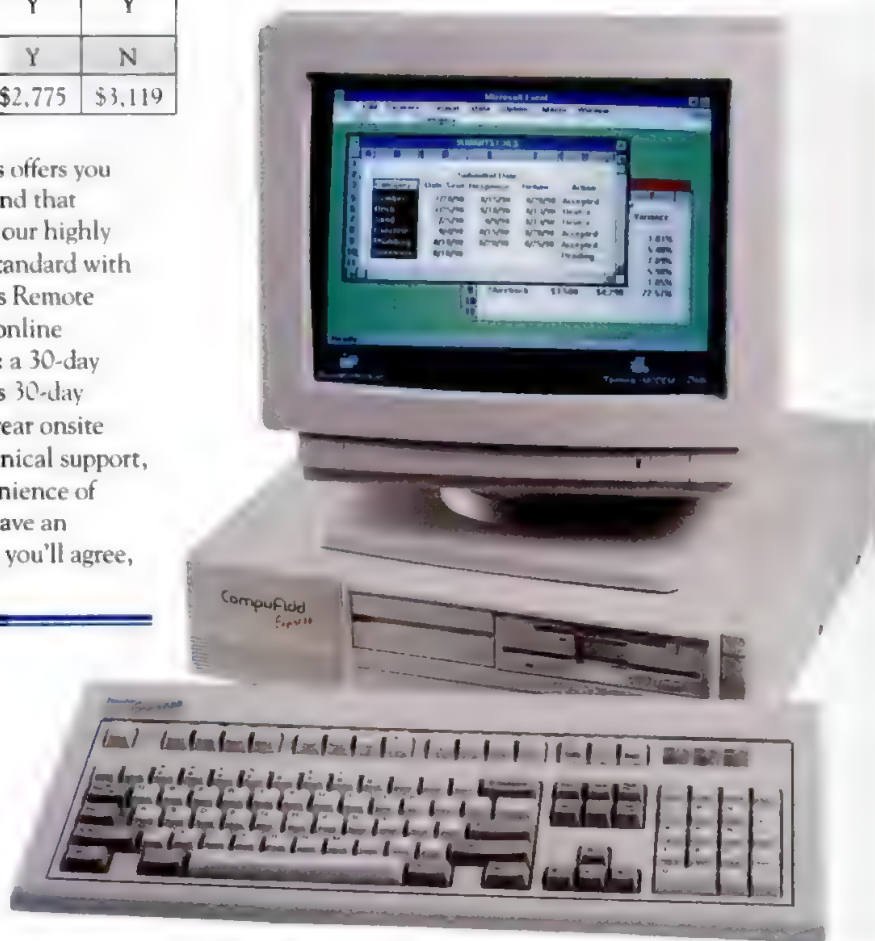


Choose one FREE

Express Scalable 466DX2

\$2,495

Lease for \$92/mo.



To get more for less, call today.

CompuAdd Express

1-800-925-9119 Code 360

12301 Technology Boulevard, Austin, Texas 78727 Hours: 8am-8pm (CST) M-F 512-219-1800 Fax 512-219-2890

We accept MasterCard, VISA, CompuAdd Express Charge, money orders, certified checks (please allow ten days for processing), CODs (minimum order \$50), company and institutional purchase orders (minimum initial purchase \$250, thereafter \$50 with approved credit) and wire transfers. Shipping charges are calculated according to weight and distance. Texas residents, please add appropriate local sales tax. CompuAdd Express will replace or repair defective hardware, software and consumable items. A 15 percent restocking fee may be charged. All returned items must be accompanied by a return merchandise authorization (RMA) number. CompuAdd Express sells and services equipment within the United States only, and will pay no customs, duties or tariffs on returned merchandise. Prices and product descriptions are subject to change without notice. CompuAdd Express is not liable for damage due to omissions or typographical errors. A copy of our limited warranty is available prior to sale from your sales representative. MS DOS 5.0, Windows 3.1, Lotus software and Close-Up 4.0 are OEM versions.

CIRCLE 131 ON READER SERVICE CARD

system to different platforms, they had to refine only the sections that interact directly with the hardware to accomplish specific tasks. Within the NT Executive—the Windows NT operating system—only the hardware abstraction layer (HAL) and portions of the kernel and memory manager are platform-specific. The remainder of the Windows NT system is independent of the physical platform. Operating systems that are derivatives of the Mach kernel, such as NeXTStep and the “still-in-the-planning-stages,” future release of OS/2 use a similar hardware-independent approach.

System transportability is only part of the Windows NT cross-platform story. Equally important is its ability to move software between systems—for example, to create applications that run under Windows NT regardless of the hardware platform.

Transporting applications among systems with different CPUs typically requires tremendous effort. In effect, programmers must rewrite and recode to match the platform hardware. Under Windows NT, developers still must recompile applications to match the platform of execution. But if they developers follow Windows NT's enforced restrictions to remain hardware-independent, they need only recompile the code with a compiler that is appropriate to the target system.

Less attention has been paid to scalability, so many portable and notebook PCs will find Windows NT too big a system to swallow. Nothing inherent in Windows NT prevents it from being installed and run on a portable or notebook system, but the hard disk storage and memory requirements are great.

One alternative we expect many users to adopt is to install Windows 3.1 on a

portable and use the Win32s subsystem to execute 32-bit applications under 16-bit Windows 3.1. You'll see some minor performance loss due to translation and 16-bit OS operating characteristics, but the tradeoff is disk space. The bottom line, however, is that Windows NT programs will run on Windows 3.1 just as Windows 3.1 applications run under Windows NT.

THE SIMPLE CONNECTION BEHIND COMPUTERS AND BACKPACK TAPE DRIVES.



It's fast. It's small. It's reliable. It's incredibly compatible.

Backpack is the best selling parallel port tape drive on the market. We'd like to tell you why.

With Backpack, tape backup is quick and simple. Just plug it into your printer port and it's ready to use. No hardware conflicts, no slots required. One model fits all IBM PCs, compatibles and portables, regardless of CPU speed.

Backpack can store up to 250MB on a tape using data compression, is completely QIC80 compatible, and reads QIC40 tapes.

With its compact size and 1Mbps transfer rate, Backpack is the smallest and fastest parallel port tape drive you can buy.

Micro Solutions is dedicated to the perfection of backup technology.

CD-ROM, hard drive, and diskette Backpack drives are also available. Call today for ordering information and a dealer nearest you.

Telephone 815.756.3411 FAX 815.756.2928

MicroSolutions

132 West Lincoln Highway DeKalb, IL 60115

SEE US AT COMDEX BOOTH #2348

CIRCLE 005 ON READER SERVICE CARD

FACT FILE

Microsoft Windows NT, Version 3.1

Microsoft Corp. One Microsoft Way,
Redmond, WA 98052; 206-882-8060

List price: As we went to press, exact pricing was still unavailable. Under \$500

Requirements: 80386-/80486-based PC, 8MB of RAM (12MB recommended, 16MB recommended for SDK)

In short: Our preview of Microsoft's new Windows-based operating system shows a totally rearchitected, 32-bit OS that will continue to support both Windows 3.1 and DOS applications. Features include a flat memory, fast 32-bit operations, built-in networking, and C2-level security. This release runs on PCs as well as Digital's Alpha AXP, and MIPS R4X00 systems

473 ON READER SERVICE CARD

The New Generation 17" Monitor



Advancing into the future is the powerful, new generation ViewSonic 17... with crispness and clarity unheard of before now. So, if a high-contrast, extremely bright, sharply focused screen is important to you, this is the answer! Plus, this remarkable monitor runs at 76Hz refresh at an astonishingly high 1,280 x 1,024 and beyond, which will give you a flicker-free image.

Our unique ViewMatch™ color control is an easy-to-use system that takes the guess work out of printing by adjusting colors to closely match printer output. Brighten the red. Lighten the blue. No problem; it works. And the ViewSonic 17 even has an ergonomically designed drop-down control panel that's as simple to use as a typewriter. More great features include digital controls and advanced anti-reflection

coating...all adding up to make this everything a 17" monitor should be. With its big screen display and edge-to-edge image, this is the monitor of choice for Windows, desktop publishing and CAD/CAM applications.

For safety and vision protection, the monitor meets strict MPR-II and ISO 9241-5 standards.

Call 800-888-8383 for more information on our products, including our new line of 13" through 21" monitors. Welcome to the New Generation.

ViewSonic®

20480 Business Pkwy Walnut, CA 91789
Tel. (909) 869-7976 Fax (909) 869-7958
CIRCLE 118 ON READER SERVICE CARD

Windows NT

TOLERANT TO A FAULT

At the systems level, the Windows NT kernel provides fault-tolerance functions, which internally handle many errors that could otherwise terminate an application or even crash the system. These exception handlers are platform-specific, but essentially Microsoft takes the exception handling in Windows 3.1 to a higher level (for more information, see "The NT Development Arena.")

More important for data-critical systems are the hard disk fault-tolerance mechanisms. These appear in more full-bodied implementations in NT Advanced Server, but make an initial appearance in Windows NT. For example, NT has disk striping, in which partitions and files are shared across several physical drives; striping boosts performance. Advanced Server has disk striping with parity, in which stored parity information

built-in tape backup operations and UPS connections that let Windows NT monitor operations and prepare for shutdown. Neither function alone is a reason to switch to Windows NT, but each may be considered a pleasant bonus.

A PERFORMER

Windows NT demands hefty hardware for its advanced operations. The system

requires at least an 80386 or 486 CPU, and cannot be installed on a 286-based computer. Microsoft recommends at least 16MB of RAM, although NT can run in 8MB. Part of the payoff is NT's ability to use 32-bit addressing to directly address up to 4GB of RAM. Because it runs in protected mode, Windows NT allocates application memory in small segments as needed, and protects each appli-

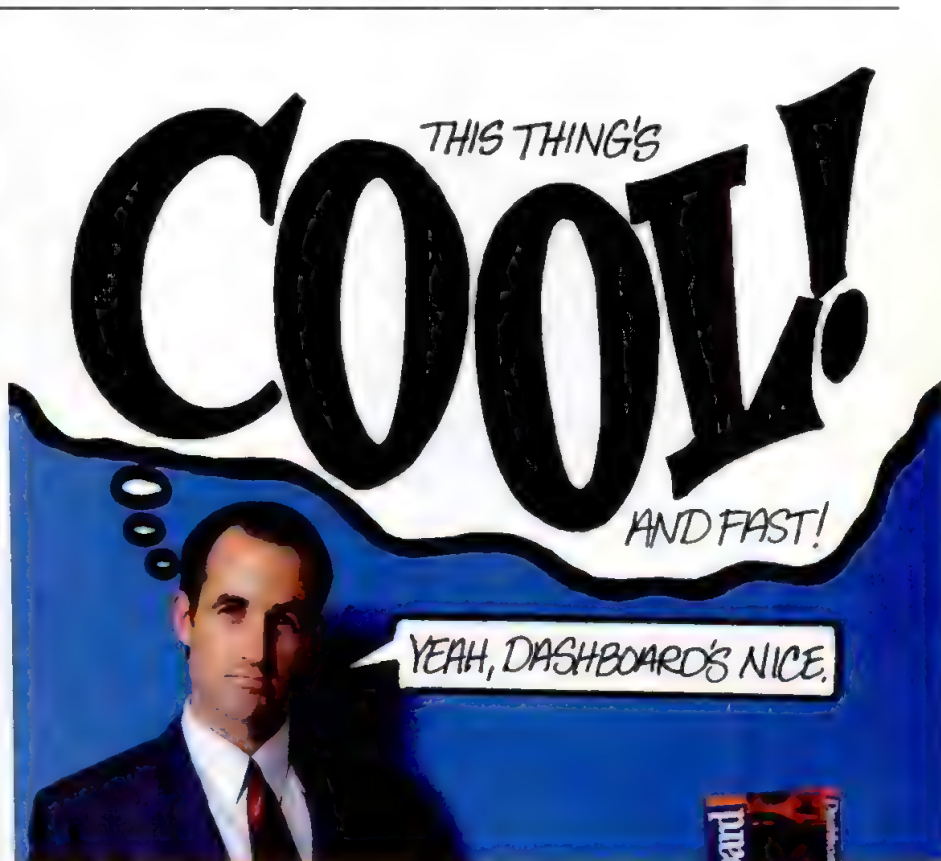
Microsoft Windows NT
demands hefty hardware—
at least an 80386 CPU—
for its advanced operations.

permits re-creation of data if one of the drive units is lost.

Other new features include Unicode—also known as "wide characters"—a system that represents characters as 16-bit values instead of traditional 8-bit character codes. Unicode is an important feature for the international market. It allows an alphabet that, instead of the traditional 256 characters, is a set of 65,536 characters—enough to represent most of the world's major alphabets plus symbol sets. In addition to being 16-bit, Unicode also separates the "essence" of the character from the font or format.

Windows NT's POSIX environment subsystem can accept POSIX-compliant applications. These may require such features as hard links, case-sensitive file names, and file-access time data. While most users do not require POSIX compliance, many government agencies use this standard, and its inclusion in Windows NT broadens the system's scope.

Other Windows NT features include



What is he thinking? People don't get excited over a push-button utility panel for Windows...do they?

Well, Dashboard does have some speedy features. Like virtual



screens that let you set up, save and switch between up to 9 full-screen views instantly. And quick launch

icons that launch your favorite applications with just a click. There's even a "fuel" gauge to keep track of your memory and resources at a glance.

So, is it fast? Is it cool? Get Dashboard, and see what you think. We promise not to look.

Order Now! Every 50th caller gets
Dashboard FREE!*

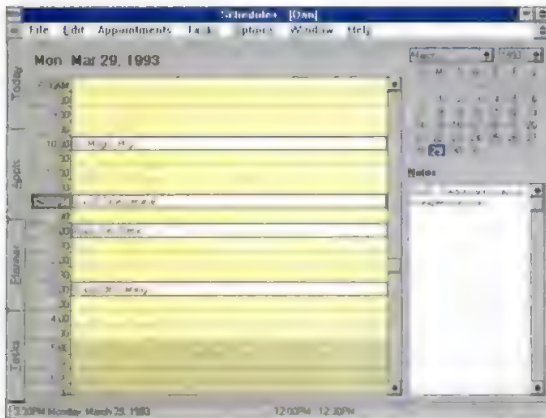
1-800-554-1305 Ext. 602P

FOR WINDOWS
Dashboard



For inquiries 408.720.4033. © 1993 Hewlett-Packard. Dashboard and Dashboard for Windows are trademarks of Hewlett-Packard Company. Microsoft Windows is a registered trademark of Microsoft Corp. *Offer ends October 31, 1993. One call per person, please.

Windows NT



The Scheduler includes an appointment calendar, planner, note pad, and task list. It can schedule appointments via the network.

cation's memory from access by other applications. When available memory is insufficient, NT uses virtual memory (the hard disk), swapping application code in and out of active memory.

Hard disk access can be a bottleneck; hard disk storage requirements are hefty. NT requires 30MB of free hard disk space to install system files, plus space for swap files; in all, 70MB of storage space is required. NT supports files as large as 1.8×10^{19} bytes (1.8×10^{10} GB).

Performance is difficult to gauge, in part because final code was not yet available as we went to press, in part because there are no 32-bit NT applications yet, and in part because benchmark-testing utilities do not compare operating systems as much as they evaluate CPUs and hardware platforms. As we went to press, we were in the last phases of development in compiling benchmark tests specifically for NT operations. But for now, since both Windows 3.1 and Windows NT execute DOS and 16-bit Windows applications, we ran some DOS- and 16-bit Windows-based performance tests. Microsoft still has some work to do to improve NT's performance. The company has acknowledged problems that we discovered—problems with floating-point calculations and with printing speeds. Fixes have already been made and will be available in the shipping version of the product.

We ran our Windows NT tests on a Compaq Deskpro M, a 486/33 with 16MB of RAM and a 330MB hard disk. First, we tested WordPerfect 5.2 running alternately under DOS 5.0, the March beta

version of OS/2 2.1, and the beta version of Windows NT. Tests included search-and-replace, spell-check, and print-to-file operations. We also ran both Ami Pro and Microsoft Excel under Windows 3.1, OS/2 2.1, and Windows NT. We timed the execution of Ami Pro and Excel macros that automate normal spreadsheet and word processing activities. With WordPerfect, Ami Pro, and Excel, DOS or Windows always performed better than OS/2 or NT. OS/2 always outperformed NT. Sometimes NT

was a little slower; sometimes it was quite a bit slower.

For example, when we used WordPerfect, Print to File took 12.70 seconds under DOS. The same task took 13.19 seconds under OS/2 2.1 and a full 17.74 seconds under Windows NT. Even more pronounced were the differences we found when using Ami Pro in a series of procedures that included printing to a file: Under Windows 3.1, Ami Pro took 65.8 seconds; it took 85.25 seconds under OS/2 2.1, and a full 160.61 seconds under Windows NT.

THE VIEW FROM MANY WINDOWS

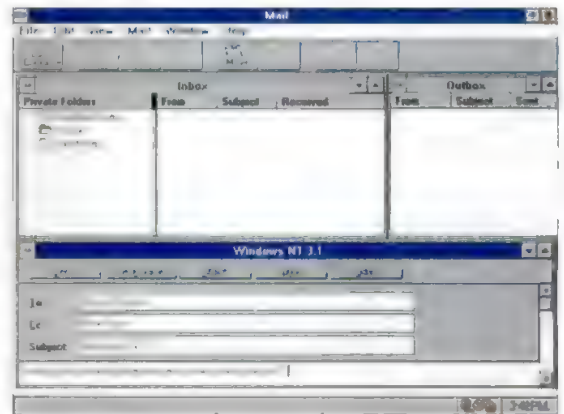
At least as of this writing, Microsoft is not espousing an "NT for all" solution. Instead, the company has been evangelizing the Windows Everywhere strategy—a family of Windows systems. Each family member is aimed at a specific group of systems or platforms but can also cooperate with and complement other members.

At present, the Windows family consists of three principal products: the popular Windows 3.1, the recently released Windows for Workgroups, and Windows NT as the newest member. Windows NT Advanced Server is expected to ship shortly after the NT release. Microsoft will continue to upgrade and support Windows 3.1—with the next version focusing on a more object-oriented architecture. Windows for Workgroups brings Windows 3.1 users peer-to-peer networking capabilities for PCs, as

well as client/server connections to other networks and servers. (For more information, see "Groupware: Are We Ready?" in this issue.)

Windows NT, still a desktop product, adds the client/server component to the peer-to-peer services, and it introduces a 32-bit version of Windows. NT's most significant differences are not in operating format, style, or appearance, but the change from a 16-bit shell running under DOS to a true 32-bit standalone operating system, and that system's portability—which lets it run on a variety of hardware platforms. Windows NT Advanced Server, which will incorporate Microsoft LAN Manager, will extend the Windows NT operating system specifically to operate network servers.

Although Windows NT does not replace existing Windows 3.1 systems or make them obsolete, the new operating system offers many advances over earlier versions of Windows as well as over earlier operating systems. Because of these advances, many users with 80386/486 systems—and, of course, users of the upcoming Pentium (586) system—will find immediate advantages in moving to Windows NT.



The Mail facility tracks incoming and outgoing mail, including deleted mail, in case you change your mind about discards.

But should you buy? In all probability, Windows NT will claim about 15 percent of the current Windows market in the near future—the 15 percent who need high-end business-environment features such as security and fault tolerance. Others might be well served by waiting for the release of Windows 4.0, which should include a fair amount of capability of its own. □



You can buy a PC without SCSI, but you can forget about I/O performance like this.

Join today's world of powerful, exciting applications while extending the productive life of your PC. Just demand a PC with high-performance SCSI I/O and give your system the ability to grow as your business grows. SCSI ties your PC, peripherals and software together to make these crucial applications soar:



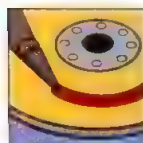
Backup

30Mb of data can cost \$25,000 to replace. SCSI tape drives can back up this data in about 5 minutes, while floppy tape drives take almost an hour.



Optical Drives

SCSI allows you to easily expand into today's powerful and exciting CD-ROM applications while you continue to use your existing devices.



Hard Drives

Chances are your powerful 486 microprocessor sits around waiting for data from a single hard disk drive. Using multiple SCSI drives, you can deliver information to your CPU in half the time it takes similar IDE drives.



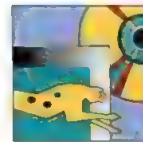
File Servers

With SCSI you get the high throughput, multitasking performance needed for Novell® and UNIX® based servers. No wonder 3 out of 4 servers today are SCSI-based.



RAIDs

To ensure data integrity for critical applications, disk arrays demand intelligent I/O. That's why over 80% of today's RAID solutions are SCSI-based.



Multimedia

Only SCSI links you to almost all multimedia devices—including emerging peripherals like photo CD, writable optical and the next generation of CD-ROMs.

So don't buy an obsolete PC. Demand SCSI and demand performance. For more information on SCSI, call 1-800-934-2766.

Adaptec

These fine manufacturers
offer computer systems with
SCSI by Adaptec:

Acer
ALR
Apricot

AST
Digital Equipment
Corporation

Dell
Hewlett-Packard
ICL

Leading Edge
Olivetti
Siemens Nixdorf

Tandon
Tulip
Unisys

Zenith Data Systems
Zeos International

CIRCLE 117 ON READER SERVICE CARD

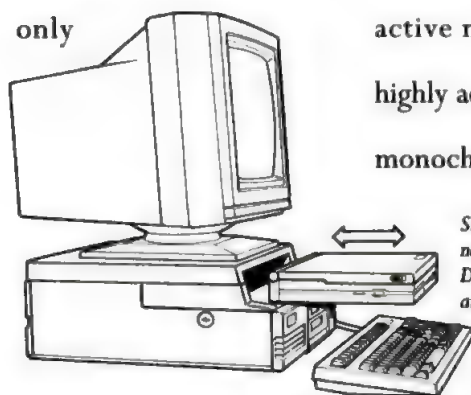
THE COMPAQ LTE LITE. FOR THEIR TIME WORKING. AND

OK, we're not saying you live on three hours of sleep, or that you eat Chinese takeout every night. And even if you do, we're not saying that a COMPAQ LTE Lite 486SL notebook is suddenly going to change all that.

What we will say is that it could make your life a lot simpler. Particularly if you travel.

You see, on one hand, these new computers are lightweight, compact notebooks (6.3 pounds, 8.5" x 11"). They're available with three different

screens: the COMPAQ UltraView – the world's only



black and white, active matrix VGA; a 256-color active matrix; and the highly acclaimed passive monochrome MaxLight.

There's the integrated EasyPoint trackball. And each has a range of innovative power-conservation features to help extend battery life.

But what also makes these notebooks unique is

Simply slide the LTE Lite notebook into the COMPAQ Desktop Expansion Base and you have a full-function, fully connected desktop computer.

PEOPLE WHO SPEND HALF THE OTHER HALF WORKING.

that they double as full-sized, full-featured 486 desktop PCs.

By simply sliding your LTE Lite notebook into

bays increase expansion capabilities. Best of all, you're using the same hard drive. So whether you're in the office or on

easy connection to your peripherals, choose the new Enhanced QuickConnect — a one-step system with integrated Ethernet and SCSI support.

And like all of our PCs, these notebooks are backed by CompaqCare. Which includes a free, three-year worldwide warranty, and a year of free on-site* service in the U.S. or Canada.

For more information about the COMPAQ LTE Lite 486SL notebooks, call 1-800-345-1518. Because if you work out of the office on a regular basis, you really lead two lives. So they're perfect for you. And you.



Unlike other 486 chips, the Intel 486SL, with an integrated numeric coprocessor, provides higher performance and extended battery life.



No wires, no interface boxes, no headaches. The optional fully integrated COMPAQ SpeedPAQ 144 Modem connects the LTE Lite directly to a cellular phone so you can send e-mail and faxes.

COMPAQ

the COMPAQ Desktop Expansion Base, you're instantly connected to printers, peripherals and your network. No floppies, no fumbling with wires, no headaches. And the extra slots and drive

the road, your files are always with you. The expansion base also offers you a keylock to secure your notebook.

Of course, if you don't need all the functions of a full-sized PC, but want

*This service is provided by Contracted Service Providers and may not be available in certain geographic locations. Certain restrictions and exclusions apply. Monitors, battery packs and certain options are covered by a one-year warranty. For further details on our limited warranty, contact the Compaq Customer Support Center.

CIRCLE 062 ON READER SERVICE CARD

COMPAQ CONTURA. THE AFFORDABLE LEAVE YOU WISHING YOU

Buying some low-priced 486 notebooks is like buying a bottom of the line car. You drive off without power steering or air conditioning or even floormats. If you get away with an AM radio, you've pulled off a coup.

At Compaq, however, we believe an affordable notebook shouldn't merely be the stripped-down, bare-bones version of a more expensive one.

Take the new 486SL Contura notebooks.

Although affordably priced, they're COMPAQ computers in the truest sense. They endure the same torturous testing as every other computer that we build.

Inside there's an Intel 486SL chip. Unlike the

4/25CX: Active color VGA ♦ Integrated EasyPoint trackball ♦ NiMH battery ♦ **4/25c:** Advanced passive color VGA ♦ COMPAQ Trackball ♦ NiMH battery ♦ **4/25:** Monochrome VGA ♦ COMPAQ Trackball ♦ Enhanced NiCd battery
All models: Intel 25MHz 486SL with 8K cache and numeric coprocessor ♦ 4MB RAM (up to 20MB) ♦ 120MB or 209MB hard drive ♦ Pre-installed Microsoft Windows 3.1 and MS-DOS 5.0 as published by Compaq
4/25 starts under \$1,999

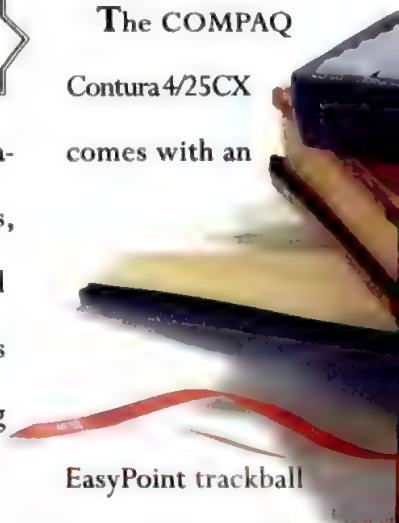
486SX chip in comparably priced notebooks, this one has an integrated coprocessor. And it runs more efficiently, helping to extend battery life.

You have your choice of three Contura screens, all of which offer razor-sharp definition. There's

an active matrix screen that displays information in 256 colors. There's an advanced passive matrix color screen that offers 50% better contrast, and 33% improved response time over earlier passive technology. And there's a crisp and clear monochrome version as well.

The COMPAQ Contura 4/25CX comes with an

EasyPoint trackball that eliminates the need for a mouse. And all of the Contura models offer a unique feature called



ABLE NOTEBOOK THAT WON'T COULD AFFORD MORE.

Hibernation. This allows
you to shut your PC off
quickly without losing

brings you right back to
where you were.

Contura notebook PCs

batteries in as little as
an hour. And a variety of
modem options, includ-
ing cellular, allow you
to send and receive data
and faxes anywhere.

All of which explains
why the editors at *PC
LapTop Computers Mag-
azine* recently named our
Contura the best value
in notebook computers.

If you'd like to know

more, give us a call
at 1-800-345-1518,

and ask us

about

Contura.

The notebook PC

designed to accommodate
your budget limitations,
not constantly remind
you of them.



*Thanks to our advanced graphics ac-
celerator, Contura blows the doors off
most other Windows notebooks. In fact,
it runs Windows 30% faster than
most 486 machines.**



*Nothing is backed like a Compaq be-
cause nothing is built like a Compaq.
Contura includes a free three-year,
worldwide warranty with a year of
on-site** service in the US or Canada.*

COMPAQ

any data, and marks the
spot where you left off.

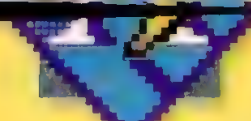
When you start your PC
up again, it automatically

also come with

an external battery charg-
er that lets you recharge

*In tests run by Compaq using PC Magazine Labs WinBench Release 3.1. **This service is provided by Contracted Service Providers and may not be available in certain geographic loca-
tions. Certain restrictions and exclusions apply. Monitors, battery packs and certain options are covered by a one-year warranty. For further details on our limited warranty, contact the
Compaq Customer Support Center

CIRCLE 308 ON READER SERVICE CARD



Ami Pro
for Windows



CorelDRAW!



Norton Desktop



ParPoint



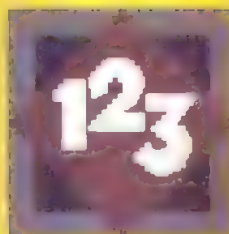
WordPerfect
5.2
for Windows



Microsoft
Excel



Harvard Graphics



Lotus 1-2-3
for Windows



PageMaker
4.0



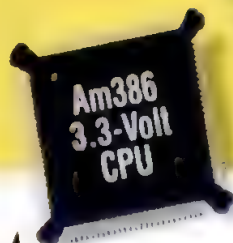
PLUS
WS



Microsoft
Word



Quicken



More Bang Per Battery.

More documents. More spreadsheets. More presentations. Essentially, you get more work done per battery when your portable contains a 3-Volt Am386[®] microprocessor.

In fact, you can expect the longest battery life available, because they use far less power than other 386 CPUs.

What's more, you won't sacrifice performance for battery life. At 25MHz, you'll get all the speed you need to run Windows[™] and thousands of your favorite applications.

That's why leading portable manufacturers have put 3-Volt Am386 CPUs at the heart of their next-generation portable designs.

And it's no wonder PC Magazine awarded the 3-Volt Am386 CPUs their 1992 Technical Excellence Award for paving the way in low-voltage design.

To make sure your portable makes the most of its batteries, make sure it's designed around a 3-Volt Am386 CPU.

800-222-9323



Advanced Micro Devices
Microprocessors For The Masses.SM

CIRCLE 047 ON READER SERVICE CARD

PREVIEW: OS/2 2.1

IBM's 32-Bit Challenger Revisited

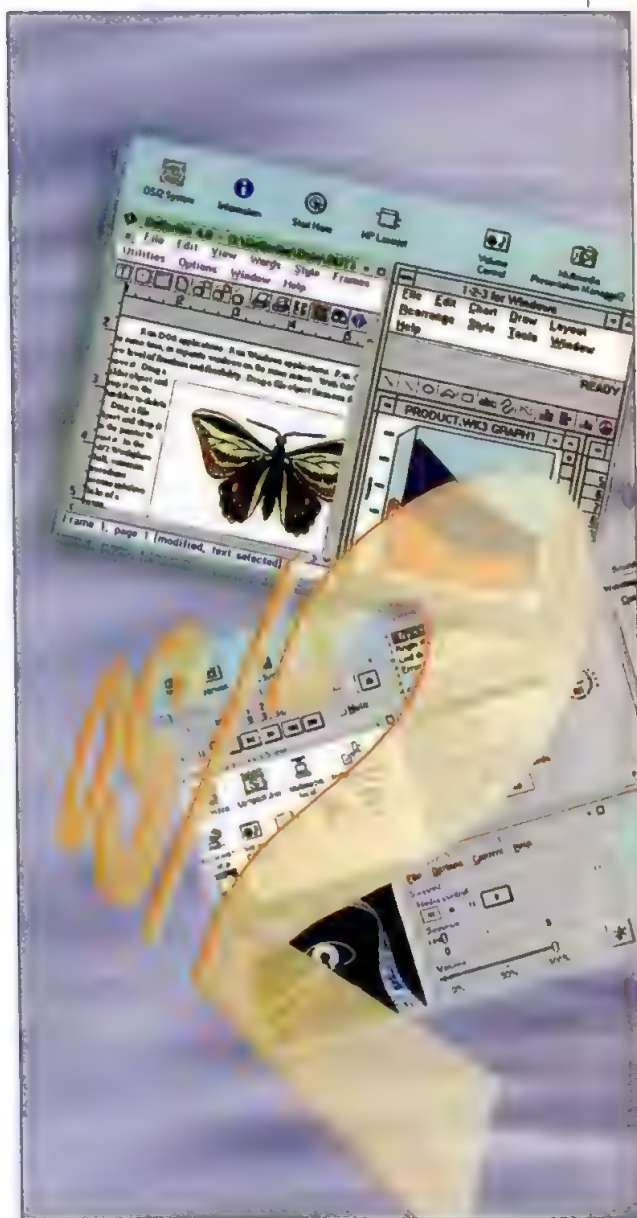
With Microsoft's Windows NT and a number of GUI-based Unix systems on the brink of release, the battle for the hearts and minds of PC power users is under way.

by Joe Salemi

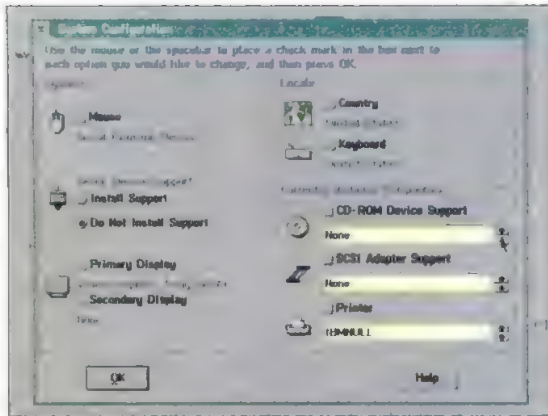
Almost a year after our preview of OS/2 2.0, we have taken a look at a beta version of the upgrade, OS/2 2.1. The changes from the last version are mostly incremental, but they go a long way toward overcoming the obstacles to wider acceptance of IBM's 32-bit operating system. Version 2.1 includes Windows 3.1 compatibility (Enhanced mode), multimedia support, better control over DOS and WIN-OS/2 sessions, and support for a broader range of peripherals. OS/2 was a front-runner in the 32-bit operating system derby. (New players have since appeared from Microsoft and Unixware. See "Windows NT: The Power Under the Hood" and "Unix on Intel: The Beast Turns Beauty" in this issue.) This revision keeps it very much in the competition.

A RECAP OF OS/2 2.0

While OS/2 2.0 was touted as the first 32-bit operating system designed entirely for Intel-based PCs, the initial release was actually a mixture of 16-bit and 32-bit modules. The operating system kernel and file system support were 32-



OS/2 2.1



OS/2 2.1's Selective Installation screen adds many more options for configuring on the fly.

bit, but the Presentation Manager GUI and the Workplace Shell (the primary user interface) were still 16-bit programs. Version 2.0 also maintained support for both the DOS-based file allocation table (FAT) file system and the High Performance File System (HPFS) introduced in OS/2 1.2.

Built-in support for multiple DOS and Windows 3.0 sessions—running either full-screen or as windows on the Workplace Shell desktop—was new in Version 2.0. Each DOS session supported all the features of DOS 5.0, including the Lotus/Intel/Microsoft expanded memory specification, extended memory specification, and DOS protected-mode interface memory. You could even load DOS TSRs into the upper memory block area. Users found they could have at least 640K of RAM available in each DOS session and raise available memory to well above 700K, depending on the DOS settings and the needs of the application.

Windows 3.0 support let users run their Windows applications as part of a single full-screen WIN-OS/2 session or as a single application running in a window on the Workplace Shell desktop. Version 2.0 also provided Dynamic Data Exchange (DDE) and common Clipboard support between Windows applications or between Windows and OS/2 applications.

But last year's release had its share of problems. Adding a new printer to the system was often an exercise in frustration, and the process wasn't at all logical. Users had to work through a couple of settings screens to find the option for adding a printer driver. The release also

lacked support for a lot of small computer system interface (SCSI) devices, particularly CD-ROMs; only IBM and Toshiba drives were supported. It also had only limited support for Super VGA (SVGA) cards. The GUI interface, still a 16-bit product, was sluggish, and the few applications written specifically for Windows 3.1 didn't run on OS/2 2.0.

IBM has addressed some of these problems by releasing new or updated system files and drivers through various on-line services, including the company's

support forums on CompuServe (see the sidebar "Supporting OS/2: IBM Shatters Tradition") and its own National Service Center BBS (404-835-6600). Late last year, IBM released a ServicePak that included all the fixes and new drivers to date, 32-bit graphics support, and additional SVGA drivers. A combination of 2.0 and the ServicePak (also known as Corrective Service Diskettes or CSDs, in IBM-speak) is now preinstalled on some IBM PS/2s.

WINDOWS 3.1 AND MULTIMEDIA SUPPORT

IBM said that the version provided for this article was the final beta of the long-

awaited OS/2 2.1, but would not provide a firm release date for the final version. A Spring Comdex release or announcement is likely.

The most important enhancement in 2.1 is the addition of full Windows 3.1 compatibility. The Program Manager, which appears as a folder on the desktop, opens in a window rather than in a full-screen session as it did in Version 2.0 (a full-screen Windows session is also still available). You can configure the Program Manager to run multiple Windows sessions. Version 2.1's WIN-OS/2 session looks identical to Windows 3.1. The Windows 3.1 support includes OLE (only between Windows programs), TrueType, and multimedia capabilities.

A number of additional Windows accessories are included in this release. While 2.0 only provided the Clock and Clipboard accessories, 2.1 adds the Notepad, the OLE utility, the File Manager, Windows Write, the Character Mapping utility, and the Media Player. The System Setup and Control Panel are identical to Windows 3.1, though the Setup utility is only used to establish the type of network connection in WIN-OS/2 sessions.

Three new settings in the WIN-OS/2 settings notebook govern the Windows 3.1 sessions. The first, and the most

HIGHLIGHTS

OS/2 2.1

WINDOWS 3.1 SUPPORT: OS/2 2.1 supports Windows 3.1, including multimedia and OLE applications. WIN-OS/2 can be run in Standard or Enhanced mode, which lets you use 32-bit Windows 3.1 applications.

MULTIMEDIA SUPPORT: OS/2 2.1 has the Multimedia Presentation Manager/2 tools that are currently available as add-ons for 2.0.

SVGA: OS/2 2.1 supports many popular SVGA cards in both Presentation Manager and WIN-OS/2 sessions; higher-resolution screens and 256 colors are available.

SCSI SUPPORT: Drivers for Adaptec,

DPT, Future Domain, and IBM SCSI cards, along with a generic driver supporting most SCSI adapters (except CD-ROM drives) are included with Version 2.1.

CD-ROM SUPPORT: OS/2 2.1 provides drivers for more than 30 different CD-ROM drives.

32-BIT GRAPHICS: Version 2.1 includes the 32-bit graphics engine introduced in the 2.0 ServicePak.

CONFIGURABLE START-UP FILES: OS/2 2.1 lets you specify or customize a start-up file other than AUTO-EXEC.BAT for each DOS and WIN-OS/2 session.

A Must-Have for Windows Users!

Microsoft MS-DOS 6 UPGRADE Only \$49⁹⁵

What will Microsoft's new MS-DOS 6 do for you? It will double the size of your hard disk drive, for starters. That alone will save you hundreds of dollars. But there's much more:

Integrated disk compression, built right in to MS-DOS 6, safely, easily and effectively doubles your hard disk space. •Memory management frees up precious memory to run your DOS-based applications. •Data protection features, including AntiVirus, Backup and Undelete, help safeguard your data. •Tight integration with Windows means that you gain even more productivity power!

Item #		Suggested Retail Price	Price Per CPU	Total Price
OP0213/5	Single Pack	\$77.95	\$49.95	\$49.95
BN1443/5	Dual Pack	\$155.90	\$44.95	\$89.90
OP0224	Three Pack*	\$187.95	\$39.95	\$119.85

*Three Pack includes one set of disks and manuals, plus 2 licenses.



MS-DOS 6 Tutorial

Unleash all the power of MS-DOS 6 with this Personal Training Systems Tutorial. It's like having an expert sit beside you. It's yours FREE with any order from MicroWarehouse. Ask for item #AA0020 when you place your order. *You pay only \$2.00 shipping and handling.

MS-DOS 6 UPGRADE

ACT! 1.1 for Windows

ACT! for Windows keeps up-to-the-minute files for all your contacts—with 70 customizable fields, date-stamped notes and an auto-generated history log. The integrated activity scheduler, with graphical calendar views, lets you schedule unlimited activities. Reschedule using ACT!'s "drag and drop" feature. Produce professional correspondence with the included full-featured



WYNIWYG word processor with spell checker. Even includes pre-defined and custom reporting. ACT! is the proven way to find, keep and satisfy your customers!
Publisher:
Contact Software
BS8204

\$249⁹⁵

LapLink V

Whether you're using DOS or Windows, LapLink V will get you up and running quickly, and transferring files and directories in minutes.

Transfer files the way you want over cable, modem or even over your existing Novell network. Automate your file transfer tasks through SmartExchange functions including Synchronize, which makes files in two directories identical. You can even record and schedule file transfer routines so that they can occur completely unattended. LapLink V comes complete with software and cables.

Publisher:
Traveling Software
1T3+14

\$109⁹⁵



WordPerfect 6.0 for DOS Upgrade

New WordPerfect 6.0 for DOS will change the way you think about DOS word processing. Now you can choose the character-based interface you're used to, or switch to a intuitive graphical interface all from the same DOS application. Features: built-in spreadsheet functions, data-driven performance analysis, and self-formatting using WordPerfect's Tables feature; support for 100+ speeds, font sizes, and TrueType scalable fonts; automatic grammar checker; 11 coaches options on the Help menu that will guide you step-by-step through almost every WordPerfect function; and much more. **Usual retail: Full version WordPerfect 6.0 for DOS WP203/5 \$299.95. WordPerfect 6.0 for DOS (competitive upgrade) \$109.95 \$109.95.**

Publisher: WordPerfect Corporation

WordPerfect 6.0 for DOS Upgrade 1P118/5

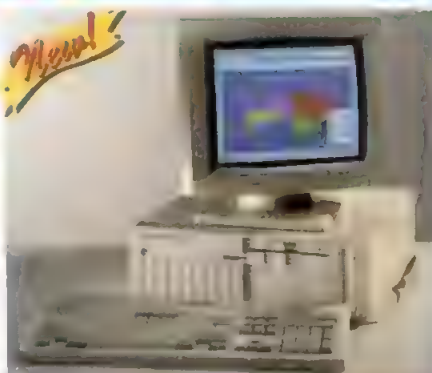
\$85⁹⁵

*WinPro 486SLC/25

The WinPro 486 is an ultra-fast PC workstation. It features a Cyrix 486SLC/25MHz processor with 2 MB RAM and 1KB internal cache. It comes complete with a 3.5" high-density floppy drive (5.25" floppy drive optional), 10" MB hard drive, a SuperVGA video controller (monitor not included), 5 expansion slots, one parallel and two serial ports, full 101-key extended keyboard and a mouse. The software you want is already installed. You'll get MS-DOS, Windows 3.1, Works for Windows, and Virscan. Call MicroWarehouse and let us help you choose the right Monitor to complete your WinPro system.

Manufacturer: Leading Edge CPU+™

\$799



FanCard II

Heat is your computer's enemy! To prevent problems, a PC should maintain a constant flow of air across the 486 to cool it. PC sources



June 1992 The FanCard will keep cool air swirling around your chips, hard disk and I/O cards, and will get needed cooling to those heat pockets that your custom-mounted fans just don't reach. No Glue. No Wires—just pop the card into a slot. The FanCard fits into any 8, 16 or 32 bit slot and is extremely easy to install. Manufacturer's 2-year replacement warranty.

Manufacturer:
T & S Microtech, Inc.
EX3010

\$49⁹⁵



Call for Overnight Upgrades!

I'm Kerry, call me at:

Micro WAREHOUSE

1-800-367-7080

Order Toll-Free 24 Hours a Day, 7 Days a Week
Inquiries: 908-370-0518 Fax: 908-905-5245

Free Micro Warehouse Catalog Subscription
1720 Oak Street, P.O. Box 3014, Lakewood, NJ 08701-3014

PM0693A

Fill out and mail this coupon to receive a free, one-year subscription to the MicroWarehouse catalog

Name _____

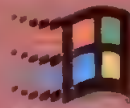
Address _____ Apt. _____

City _____ State _____ Zip _____

(Expect to receive your next issue within 4-6 weeks)

CIRCLE 225 ON READER SERVICE CARD

Micro WAREHOUSE



Micro Warehouse is the leading source for all your computer needs. For all of your computer needs, call 1-800-367-7080. We have the lowest prices on all computer hardware and software. We are the only computer store that has a 24-hour hotline.

Call toll-free 1-800-367-7080

OVERNIGHT
DELIVERY
ONLY \$7.00

Item numbers ending in 3 and 5 denote products available in 3 1/2" and 5 1/4" formats respectively. Item numbers ending in 4 denote that both formats are included. Please refer to item numbers when ordering.

★ Windows-compatible products ★ Call for available upgrades

Acce Software		
BS7303	★ AceFile 2.0 for Windows	99
Adobe		
GR6513	★ Adobe Photoshop 2.5 for Windows	549.95
PR1594	★ Adobe Type Manager 2.0	59
GR5683/5	★ Adobe TypeSet Value Pack	39
Agfa		
GR5654	Desktop Styles	49
GR6344	Discovery TrueType Pack	49
Aldus		
GR6583/5	★ Aldus PageMaker 5.0	589.95
GR5034	★ Aldus PhotoStyle	529.95
Altais		
GR5543	★ Fontographer for Windows	265
Approach Software		
BS7374	★ Approach 2.0 for Windows	249.95
Area Software		
GR3074	★ FontMonger for Windows	89.95
Arise Software		
HR1084	★ MasterCook PC for Windows	39.95
Artisoft		
NT1010	Lanestic 2 MBPS Adapter Card	149.95
AutoDesk		
CA0173/5	Autosketch 3.0	89
CA0074	Generic CADD 6.0	285.95
AutoMap, Inc.		
BS5224	AUTOMAP	50.95
BS7583	★ AUTOMAP for Windows	59
Berkley Systems		
GR1594	★ After Dark 2.0 for Windows	29
GR5883	★ Star Trek the Screensaver	35
Borland International		
LN0563	Borland C++ 3.1	329
BS7183/5	★ Paradox 4.0	539.95
BS7833	★ Paradox for Windows full upgrade	129.95
BS7813	★ Quattro Pro for Windows	95.95
LN0463/5	★ Turbo C++ 3.1 for Windows	106
Brown Wagh		
EX1860	Sound Blaster Pro w/ Midi Kit	189.95
FX		
FX0314	★ FaxMaster	79
IN2520	OmniPage Direct	269
Calera		
UT3154	★ FAXGrabber 1.2	65
Canon		
PR1500/10	Bubble Jet BJ-10ex (White/Gray)	259
Central Point Software		
UT3033/5	★ PC Tools Deluxe 8.0	119.95
UT3343/5	★ PC Tools for Windows	119.95

Alpha FOUR Version 2.1 Server Unit Bundle

Then, AlphaFour Version 2.1 is the most powerful relational database management and application development system designed for people who want to get their work done in their programming. Also available: Alpha FOUR Version 2.1 (competitive Upgrade (Stand alone/single user only) \$1019.95 \$89.95)

Publisher: Alpha Software Corporation

Alpha FOUR Version 2.1 Multi User Server Unit (LAS 2 Pack valued at \$1049 bundled inside FREE)

BS7604

\$339.95

Claris		
BS7294	★ FileMaker Pro 2.0 for Windows	119.95
BS7883	★ Claris Works 1.0 for Windows	95.95
Computer Associates		
GR1823	CA Cricket Graph 1.3	79.95
FN0773	★ ACCPAC Simply Acc. 2.0 Windows	119.95
Contact Software		
BS6954	★ ACT! for Windows	249.95

NETROOM 3.0

NETROOM is the most complete set of memory management tools available - eliminating "RAM-Cram" and super-charging your PC! NETROOM features "Cloaking," which reduces 96K of BIOS to 8K by running in protected mode, providing superior DOS/Windows compatibility. Includes "Cloaked" utilities which occupy virtually no memory: Disk Cache, Screen Saver, RAM Drive, Virus Protection, etc. Also available in 4, 10, and 50 user. Call. Publisher: Helix

Single user
UT3184

\$64.95

Creative Labs		
GR6354	★ VideoSpigot for Windows	449
Cypress Software		
FN0674	Mortgage Minder	32
DeLasterm Tech.		
CM0634	★ PROCOMM PLUS for Windows	95.95
DCA, Inc.		
CM0654	★ Crosstalk 2.0 for Windows	95.95
Deirina Technology		
BS7253/5	★ Perform Pro Plus for Windows	248
FX0334	★ WinFax Pro 3.0	79
Digital Vision		
EX1810	ComputerEyes Color/RT	469
Disks (boxes of 10)		
	BASF Sony Maxell KAO and bulk Fuji	Call
Farallon		
NT4094	★ Timbuktu 1.0 for Windows	139
Fifth Generation		
UT0724	Direct Access 5.1	65
Fractal Design Corp.		
GR5534	★ Painter 2.0	259.95
Genesis Integrated Systems		
CD0840	GenStar 300/101 MPC CD-ROM Kit	199
Gold Disk		
GR5763/5	★ ScreenCraze 2.0 for Windows	25.95
GR6194	★ Video Director for Windows	119
Hayes		
MM2640	ACCURA 144 • FAX144 External	249.95
MM2540	ACCURA 2400 External	69.95
MM2210	OPTIMA 96 • FAX 96	379.95
MM2190	OPTIMA 144 • FAX 144	399.95
Hewlett Packard		
UT2894	★ Dashboard for Windows	45.95
IBM		
UP0233/5	★ OS/2 2.0 Upgrade DOS/Windows	99.95
Inset Systems		
UT2414	★ Hyjak 2.1 for Windows	129.95
Intuit		
FN0164	Quicken 5.0	43
FN0564	★ Quicken 2.0 for Windows	39.95
Iomega		
DR2065	Bernoulli 90MB Cartridge One Pack	145.95
DR2240	Bernoulli PC Powered	499.95
DR2400	Iomega Tape 250 Insider	214.95
Kensington		
AC0140	Masterpiece Plus	95

Leading Edge		
PD470	WAPRIS 486 SLC-25	799
Logitech		
PD07	ScanMan 256	269.95
Lotus		
	★ Lotus 1-2-3 2.4	335.95
	★ Lotus Ami Pro 3.0	239.95
	★ Smart Pics for Windows	99.95
Media Vision		
	★ Audio Spectrum 16	205.95
Memory		
	SIPPS SIMMS, DRAM	Call
MY0013	SIMM 1MB 100ns	59
MY0005	SIMM 1MB 70ns	65
MY0004	SIMM 1MB 80ns	62
Microcom		
CM1754	★ Carbon Copy 2.0 for Windows	139.95
Micrograph		
GR2833/5	★ Windows Draw!	99.95
BS7623	★ ABC Flowcharter 2.0 for Windows	299.95
Microsoft		
BS7553/5	★ Access	89
N2150	Ballpoint Mouse	119
BN0643/5	★ C/C++ Compiler 7.0	319.95
BS2533/5	★ Excel 4.0 for Windows	299.95
BS7433/5	★ FoxPro 2.5 for Windows	299.95
BN0594/60	Mouse (mouse)	69.95
WF0333/5	★ Word 2.0 for Windows	299.95
BS5324	★ Works for Windows	129.95
MicroSolutions		
DR1240	Backpack 1.4	210
MicroTouch Systems		
IN0810	The UniMouse	129.95
MicroWarehouse		
BN0960	386/SX 33 MHz w/Color Monitor	999
BN0970	486/SX 25 MHz w/Color Monitor	1299
Monitors		
MT0500	Magnavox 17" Autocast	849
MT0280	ParaSync C1361 14" VGA Color	369
Norton-Lambert		
CM0503/5	★ Close-Up Dual Pack Remote	119
Pacific Microelectronics		
UT2903	Mac-In-DOS 1.2 for DOS	59
J12913	★ Mac-In-DOS 2.0 for Windows	109.95
Panasonic		
PR2200	KX-P1124x Printer	299.95
Passport Designs		
EN2794	★ MusicTime for Windows	159

Outside In 2.0 for Windows

Outside In for Windows is a file viewing and data manipulation utility. Use it to view files and copy data to the Clipboard with formatting intact. Outside In supports word processing, spreadsheet, database, graphics and ZIP files from DOS, Windows and Mac programs. Use it with E-Mail to view attachments. Requires a Windows compatible computer. Publisher: Systems Compatibility Corporation UT3144

\$64.95

Peachtree Software
FN0654 Peachtree Basic Accounting 6.0 75.

Persona Technologies
EX2060 PC Speakers 179.95

Physiotronics Corp.
UT3583 ★ Sherlock The Ultimate Wind. File Mgmt. 99.95

filePro Plus

filePro Plus is a relational database package that's easy to work with and virtually impossible to outgrow. With its powerful menuing system, you can give all your applications a clear, consistent look. filePro Plus also makes an ideal LAN and multi-user system solution, because of its excellent portability across a broad range of platforms and operating systems. Publisher:

The Small Computer Company
BS7023/5

\$339

PinPoint Publishing		
HH0214	★ Micro Cookbook 4.0 for Windows	39.95
HH0184	Micro Cookbook 4.0 for DOS	39.95
Pixar		
GR6264	Pixar Typeset	185
Pluma		
EN3663	★ Capitalist Pig for Windows	35.95
PostCraft International		
GR5333	★ Effects Specialist for Windows	109
Practical Peripherals		
MM3100	Practical Mod 14400/FXA V 32BS Ext S&R419	149.95
Prochance		
IN2490	PowerMouse 100	149.95
Quadrangle Software Corp.		
BS7433	★ A Place for My Stuff	79.95
Qualitas		
UT0684	386/AMX 6	61
Quark		
BN1153	★ QuarkPress for Windows w/fonts	589.95
Quartermaster Office Systems		
EX1103/5	QEMM 386 5.0	61
BS1043/5	Desigview 386 2.4 with Manilest	129.95
Rupp Corp.		
UT2644	★ FastLync 2.0	89.95
Server Technology		
CM0590	Remote Power ON/OFF Switch	119.95
Shapeware		
GR6263	★ Visio	199.95
Softkey Software		
GR5449	Key CAD Complete	39
SWFTE		
GR5433/5	★ TypeCase	39.95
Symantec		
UT3463/5	★ Norton Desktop 2.2 for Windows	115.95
UT3433	The Norton Utilities V 7.0	19
Targus		
AC2060	The Targus NotePack	39
AC2070	Universal Notebook Case	69
Tec		
DR0910	Tec 3.5 1.44 FD w/Mounting	60
Telaware		
FN0413	★ MY D.B.3.0 for Windows	109.95
The Complete PC		
FX0060	The Complete Communicator 3.0	299
The Software Toolworks		
ED2563/5	★ World Atlas 3.2 for Windows	49.95
Touchstone		
UT0734	★ CheckIt PLUS	85
Traveling Software		
UT3414	★ LapLink V	109.95
Zoom Telephonics		
MM2300	FCV v 42 Fax Modem Internal	109.95
MM2140	VFX v 32 BIS Ext 14400 S/R Fax	239.95
MM2130	VFP V.32 Bis Int 14400 S/R FAX Int.	199.95

Presentation Task Force CGM Clip Art 4.0

Now you can own the clip art PC Magazine recently named... The best CGM clip art package for overall quality and usability. Presentation Task Force CGM clip art products feature over 3,500 high-quality, color illustrations in compact and comprehensive volume! Use PTF clip art in database presentations, newsletters, and spreadsheets designed with over 100 leading DOS and Windows applications, including CorelDRAW, Creative Harvard Graphics, Microsoft Publisher, PageMaker, Persuasion, PowerPoint, Quattro Pro, Ventura Publisher, Word for Windows, WordPerfect, and many more. PTF also contains people, animals, business symbols, medical illustrations, holidays, sports, military, and many more related images. Publisher: New Vision Technologies, Inc. GR3174

\$129.95

Micro WAREHOUSE

1720 Oak Street, P.O. Box 3014, Lakewood, NJ 08701-3014
©1993 Micro Warehouse, Inc.

- Visa and Mastercard accepted
- Your credit card will not be charged until your order is shipped
- Purchase orders subject to credit approval
- All products covered by 120 day full warranty. Defective software replaced immediately. Hardware replaced or repaired at our discretion
- Connecticut, New Jersey and Ohio residents add applicable sales tax
- Orders for in-stock items placed by 12:00 midnight (E) weekdays (barring system failure, etc.) ship overnight by Airborne Express (Some areas require an extra day)
- Shipping charge \$7 per order up to 7 lbs \$1 per lb above 7 lbs
- UPS ground service also available upon request - \$3 per order
- UPS orders placed by 3:00p.m. (E) weekdays, ship same day
- Actual freight charges apply for computers, hard disks, Bernoulli's tape backups, monitors and printers
- Alaska, Hawaii, outside continental U.S. APO/FPO call for information
- Item availability and price subject to change without notice
- We reserve the right to limit quantities
- Some products not available outside U.S. Please call for more information
- Not responsible for errors or omissions

OS/2 2.1



Version 2.1 includes full support for Windows 3.1. This is the Windows 3.1 Program Manager running in a window.

important, sets Windows to run in either Standard or Enhanced operating mode. Improved Windows 3.1 compatibility lets you run 32-bit Windows applications. The other two WIN-OS/2 settings control whether the DDE capabilities and Clipboard are private to WIN-OS/2 sessions or can be used to share data with OS/2 applications. If you don't need to share these capabilities with OS/2, you can make a bit more RAM available for your Windows applications by disabling these settings.

A WIN-OS/2 settings icon in the System Setup folder lets you set global defaults for Windows applications that you run directly from the desktop; programs run from the Program Manager or full-screen WIN-OS/2 sessions inherit the global WIN-OS/2 settings established for those sessions. You can still manually adjust the setting for each application that has an icon on the desktop if the defaults aren't appropriate.

The Migrate Applications utility in the System Setup folder gives you an easy way to add Windows applications to your OS/2 desktop, even if they're already defined in the Program Manager.

The Windows 3.1 multimedia capabilities work in conjunction with OS/2's Multimedia Presentation Manager/2 (MPPM/2), currently available as a 2.0 add-on but included in 2.1. It supports the IBM M-Audio card, the Creative Labs' Sound Blaster series of sound cards, and the Media Vision Pro AudioSpectrum 16 card and allows playback of audio and multimedia CDs with a supported CD-ROM drive.

If you choose to install MPPM/2, the Sound Setup utility now lets you assign sounds from .WAV files to specific events. A volume control and folder with multimedia utilities is also added to the desktop. A new option that lets you control if and when DOS and WIN-OS/2 sessions can access the audio card has been added. Special WIN-OS/2 drivers let you use the sound card in Windows sessions as well, with the same support for playing .WAV files or adding them to system events found in Win-

dows 3.1.

OS/2 2.1 includes built-in support for both the Adobe Type Manager (ATM), which was present in 2.0, and TrueType in WIN-OS/2 sessions. The built-in ATM has been updated to Version 2.5. TrueType fonts are not included, but they can be added with new Windows applications or through the Fonts icon in the WIN-OS/2 Control Panel.

Version 2.1's Windows 3.1 support is likely to be the last upgrade to OS/2. IBM's cross-licensing agreement with Microsoft expired in September 1992, and because of the often-public rivalry between the companies, the agreement has not been renewed. No one can say what incompatibilities may crop up when Microsoft releases Windows 4.0 or the 32-bit version that is reported to be in development.

OTHER IMPROVEMENTS

A new option in the settings notebook called DOS_AUTOEXEC lets you specify a start-up file other than the default AUTOEXEC.BAT so you can completely customize all sessions. The settings notebook itself looks much cleaner and much more like a spiral-bound notebook (see photo).

A FAX/PM applet to send and receive faxes is new to the Productivity folder. It works with any Class 1 fax device, such as a fax card or modem.

The installation process for the new version is very smooth and seems to need less time than it did under 2.0. A new version of the Selective Install program, which eases both system reconfiguration

and the addition of peripherals, is included. New checklists let you add a CD-ROM, SCSI adapter, or new printer at any time.

Version 2.1 includes support for SCSI adapters, including the leading models from Adaptec, AHA, Distributed Processing Technology (DPT), Future Domain, TMC and, of course, IBM's own PS/2 SCSI adapters.

The generic SCSI driver IBM introduced after the release of 2.0 is also included in 2.1, though it doesn't support CD-ROM drives. Support is provided for CD-ROM drives from DRM, Hitachi,



FACT FILE

OS/2 2.1 beta

IBM Corp., Old Orchard Rd., Armonk, NY
10504; 800-426-2468, 914-765-1900

List price: \$195 when released; upgrade price from previous versions not yet announced

Requires: 386SX or better, 4MB RAM (8MB recommended), 60MB hard disk space, graphics card, and monitor (VGA or better recommended)

In short: IBM's OS/2 Version 2.1 has full Windows 3.1 capabilities, including OLE, TrueType, and multimedia, and it also has increased levels of support for Super VGA, SCSI, and CD-ROM devices. The package also includes the OS/2 Multimedia Presentation Manager/2 (MPPM/2) modules. Many minor improvements make the configuration of DOS and WIN-OS/2 sessions easier. Overall, the changes in 2.1 make OS/2 more capable of running your existing applications and new applications.

 ON READER SERVICE CARD

NEC, Panasonic, Pioneer, Sony, Texel, and Toshiba. Many vendors of unsupported CD-ROM drives are working on OS/2 2.x drivers.

OS/2 2.1 also has far better support for SVGA systems. Higher-resolution screens (for instance, 800-by-600) and 256 colors are available. The beta we

looked at includes drivers for SVGA cards that use the following chip sets:
 ATI Technologies: ATI 28800
 Cirrus Logic: CL-GD5422, CL-GD5424
 Headland Technology: HT209
 IBM: VGA256C

Trident Microsystems: TVGA 8900C

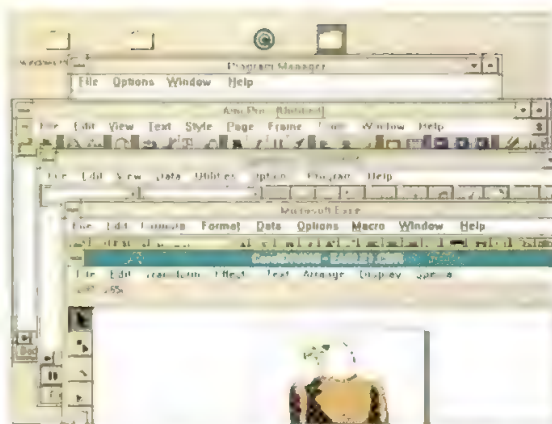
Tseng Laboratories: ET4000

Western Digital Imaging: WD90C11, C30, and C31 in C30 mode.

Other enhancements include support for the Advanced Power Management specification, which lets the operating system control battery consumption on portable computers, and drivers for PCMCIA devices. Drivers for a number of printers are also supported. The new default system font is also slightly larger and bolder than the one in 2.0, which makes the menu items and icon titles a bit easier to read. Instructions are available to reset the default to that of 2.0.

SYSTEM REQUIREMENTS

System requirements for OS/2 2.1 are almost identical to those of Version 2.0's: a 386SX-based PC or better is required, with a minimum of 4MB RAM. The operating system itself takes up 3MB to 5MB more disk space than the Version 2.0, depending on the options you choose to install; about 35MB for a full installation. Most of the additional disk space is used by the files that provide Windows 3.1 compatibility. As in the earlier version of OS/2, we recommend you have at least 8MB of RAM to avoid system slowdowns from constant swaps to the hard drive. Even though OS/2 runs on 386SX and DX systems, you'd be better off using at least a 486SX.



The update also features improved support for Windows 3.1 applications, including higher-resolution screen modes.

The beta version we obtained came on 25 3.5-inch disks, including two disks of display drivers and four of printer drivers. The MMPM/2 files come on three 3.5-inch disks. IBM has also been distrib-

■ Supporting OS/2: IBM Shatters Tradition

by Joe Salemi

Toll-free support numbers? On-line forums? Electronic bulletin boards? What happened to the IBM that used to send you to your certified IBM dealer for help?

These days, if you're having a problem with OS/2 Version 2.0, you can call IBM's own support line, which is listed in the manuals (1-800-237-5511), to register. Alternatively, if you're a member of the ZiffNet on-line service, you can jump across the gateway to CompuServe and get help there with OS/2 problems in one of several IBM forums. And if you're not on CompuServe or ZiffNet, you can call IBM's BBS in Atlanta to get help.

In trying to ensure that a product as complex as OS/2 would be successful in the marketplace, IBM decided that it had to make sure that users had access to the best support possible. And that decision meant that IBM itself had to provide the help. The company's unusual support effort began even before the release of Version 2.0 with the establishment of the IBMOS2 forum on CompuServe last April. The forum served OS/2 users as a source of

information, support, bug-fix files, and, eventually, full copies of the Corrective Service Diskettes (CSDs). IBM uses CSDs to distribute both patches and minor upgrades to its operating systems.

Before the IBMOS2 forum was established, the exclusive sources of CSDs were authorized IBM representatives and IBM's National Service Center (NSC) bulletin board system in Atlanta (404-835-6600). In the process of making the fixes available on CompuServe, IBM made them significantly easier to obtain for a great many OS/2 users.

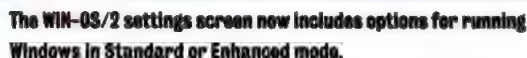
The IBMOS2 CompuServe forum became so popular that IBM split it into four separate forums; one for OS/2 support, one for OS/2 users to talk to each other, and two for developers. The company also added a library area so that users could download the CSDs without ever having to go into one of the forums.

Finally, IBM established a direct support line for OS/2 users who don't have access to a modem or who need immediate support. The support line costs \$129 a year, although the first 60

days are free. IBM also offers OS/2 with a 90-day money-back guarantee. If technical support personnel fail to get a user up and running, IBM has promised to refund the purchase price with no questions asked.

The company also established a compatibility laboratory within its Boca Raton facility so that it could test its new operating system for compatibility with machines made by other vendors. The laboratory also publishes a frequently updated list of third-party machines that have been certified as OS/2-compatible; the list is available in ASCII form on both CompuServe and on the NSC BBS.

There are still occasional complaints about IBM's support, mostly regarding the amount of time it can take to get a response to a problem. However, IBM has been very open about bugs in OS/2 and is constantly posting fixes on the on-line services. Many technical problems can be solved by using these fixes; longtime observers of IBM say the amount and quality of support provided for OS/2 2.0 is a major improvement over the company's support in the past. □



The 32-bit graphics engine shipped last fall ran noticeably faster than the 2.0 version, and the engine in 2.1 is even better; windows popped open more quickly and screen updates were much quicker. The new video drivers seemed to make the screen both sharper and brighter. We did encounter a few bugs in the video drivers, particularly when resizing Windows applications running on the desktop. However, this is to be expected in

We ran the tests on a Compaq Deskpro 486/33 with 16MB RAM and a 300MB hard disk. The two OS/2 systems

CIRCLE 058 ON READER SERVICE CARD

OS/2

CHANGE YOUR OPERATING SYSTEM.

PRESENTING WORDPERFECT 5.2 FOR OS/2

Now when you switch to the system of the future, you can get the one word processor that helps bring everyone along. Namely, the new WordPerfect[®] that's native for OS/2. Right from the start, it runs

just like other graphical versions of WordPerfect, so more people already know it than any other. And besides saving you from training all your users, it can also save you from losing all your files. Because not only does every WordPerfect



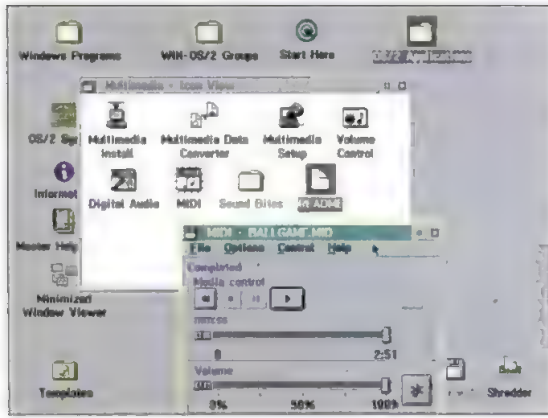
WITHOUT CHANGING THE WAY YOU OPERATE.

ALL OTHER BRAND AND PRODUCT NAMES ARE TRADEMARKS OR REGISTERED TRADEMARKS OF THEIR RESPECTIVE COMPANIES. ©WORDPERFECT CORPORATION 1990

DOS, Windows, RS/6000 and VAX file you have remain fully compatible, you can exchange every WordPerfect AS/400, VMS and IBM 370 file as well. All this ease, however, should not be confused with ability. WordPerfect 5.2 comes filled with best-

of-breed features and advanced Workplace Shell integration. So if you're stepping forward to OS/2, don't make everyone take two steps back. Get WordPerfect 5.2. For a free brochure or demonstration disk call (800) 526-5173 today.

WordPerfect



Support for multimedia applications is available through Multimedia Presentation Manager/2 (MMPM/2).

used the HPFS. In both cases, we found that 2.1 runs anywhere from 50 percent to 100 percent faster than Version 2.0. WIN-OS/2's performance was similar to that of Windows 3.1 running on the same system. The Windows 3.1 system was appreciably faster when run on an otherwise identical system equipped with a graphics accelerator card. We can't draw any firm conclusions from this difference,

though, as the 2.1 beta didn't include SVGA drivers for the Compaq SVGA card in our test system, so it didn't take advantage of the potentially higher performance an accelerator card provides.

We also found that OS/2 2.1 fixes many of the problems in the WIN-OS/2 session of Version 2.0; notably, the Clipboard and DDE support were better. In 2.0, the performance benchmark suite sometimes failed because the Clipboard ran out of memory. On the 2.1 system, the tests ran without a hitch. Windows under OS/2 2.1 is as stable as Windows 3.1 itself under certain conditions.

Windows applications also performed much more smoothly under 2.1, aside from the small bugs in the video routines. We had no problems running multiple copies of the Program Manager on the desktop and starting different applications from each one.

We have received some reports that

many 16-bit Presentation Manager applications failed to run under earlier versions of the OS/2 2.1 beta. We ran a couple of 16-bit and 32-bit PM applications on the latest beta and didn't have a problem with any of them. Whatever compatibility problems existed with earlier versions of OS/2 software in early betas seem to be solved in this one.

We used a Sound Blaster Pro to test both the OS/2 MMPM/2 and WIN-OS/2 sound systems. The OS/2 sounds worked fine, as did the included utilities that play WAVE (.WAV) and MIDI (.MID). We had a few problems getting the Sound Blaster to work properly in a DOS or WIN-OS/2 session, though again this is a known bug that IBM promises to fix by release.

THE COMING OS WARS

Overall, we were very pleased with the appearance and performance of OS/2 2.1, even as a beta product. We did not encounter any bugs that IBM didn't already know about. Windows 3.1 compatibility works as promised. In some

Oh sure, they tell you they've got an accounting system that operates under Windows and has promising new functionality. But before you take the bait, take a closer look.

need retraining and new hardware? When will their product be available? A year from now? Two? Can you wait that long? Furthermore, have their systems been thoroughly tested?

Some accounting tempt you with can be very

Find out if they truly offer a full Windows solution today. Or are they baiting you with a promise? Will it integrate with their DOS product? Is there an easy path to Windows? How much does it cost? Will you

Chances are, you'll discover the technology they're trying to lure you with has more holes than a hunk of Swiss cheese.

Truth is, only Macola Software brings you tomorrow's

ways, IBM has fulfilled its promise of "Better Windows than Windows."

The big question now is the future of OS/2. With Microsoft's Windows NT and a number of GUI-based Unix systems on the brink of release, the battle for the hearts and minds of PC power users is under way. Microsoft claims that Windows NT will have all the power now available in OS/2 2.1, including support for DOS and Windows 3.1 applications. Microsoft is also promising support for 16-bit OS/2 applications. There are two other areas where NT may have an advantage over OS/2: security and support for multiple processing systems and source code-compatible versions for a number of RISC CPUs. NT also builds in peer networking services, which OS/2 is sorely lacking. On the Unix side, the NeXTStep operating system provides support for most DOS and Windows applications, and Solaris is slated to do the same.

Even IBM is planning its own competitor to OS/2 2.1, in the form of the Taligent operating system under develop-

ment with Apple Computer. IBM has disclosed that work continues on a version of OS/2 based on the Mach Unix kernel that will run on non-Intel systems.

Ironically, OS/2 2.1, which was criticized initially for its power requirements, may now have the advantage of demanding fewer system resources than its competitors. Windows NT will need 8MB to 16MB RAM and 50MB to 70MB hard disk space. Unix is notorious for being resource-intensive, and both Solaris and NeXTStep require at least as many resources as will NT.

The long-anticipated 32-bit OS/2 applications are starting to appear. Lotus has released OS/2 2.x versions of 1-2-3/G and Freelance and has promised a 32-bit version of Ami Pro. Thirty-two-bit versions are also available for CorelDRAW, Micrografx Designer, and the Describe 4.0 word processor. WordPerfect has announced that a PM version of its flagship word processor will be released when WordPerfect 6.0 for DOS comes out later this year. Borland's release of a 32-bit OS/2 version of its C++

compiler should speed application development.

OS/2 2.0 has a year's head start on its competitors, and IBM has used that time well. It has made Version 2.1 compatible with existing DOS and Windows applications while ensuring continued support for new 32-bit applications. OS/2 sales have been increasing, and user interest continues to grow.

Is OS/2's momentum enough to keep it ahead of the pack or will Windows NT or a Unix contender come out on top? The answer depends on how well the other operating systems maintain compatibility with existing applications while moving their users to the 32-bit world. The moderate sales of OS/2 1.x taught both IBM and Microsoft that users are only willing to move to a new operating system platform if they don't have to give up their investment in current applications. The next year or two will tell which company has learned this lesson best. □

JOE SALEMI IS A CONTRIBUTING EDITOR TO PC MAGAZINE.

accounting technology today. It's called the *Progression Series*. And it's the *only* software that offers you a safe, budget-conscious path to the emerging technology of Windows. Even more remarkable, Macola's *Progression*

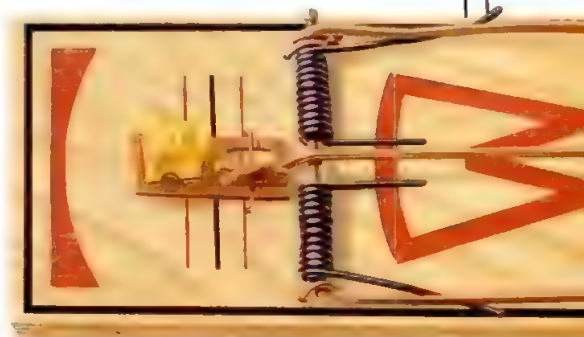
Past, Present and Future of Multi-User Accounting Software."

Call Macola today, 1-800-468-0834. We'll show you how to avoid the traps and progress to the future.

software vendors technology that misleading.

Series lets you run DOS, Windows and OS/2 platforms at the same time. That's true interoperability. Risk-free!

If you'd like more information to nibble on, give us a call. We'll send you a *FREE* White Paper entitled, "The



1-800-468-0834

MACOLA®
SOFTWARE

Accounting Software You'll Never Outgrow.

For \$249, You Could Be Working In The Future Instead Of Waiting On It.

You already own Intel-based, 32-bit hardware. You can own an advanced operating system too, if you stop waiting on promises. The UnixWare™ Personal Edition is available now. It's proven. It's stable. It runs thousands of UNIX®, MS-Windows™ and DOS applications. And it's yours for just \$249!

Plus, UnixWare delivers unmatched access to your Novell NetWare® environment. After all, they were made for each other.

The future is clear. The advanced desktop is here. The price is right, and the phone number is below.

UnixWare™
UNIX POWERED. NETWARE READY.™
From Univel, a partnership of Novell and USL.



The Right Technology Now™ 1-800-879-6168.

UNIX ON INTEL

The Beast Turns Beauty

With 32-bit power, sophisticated GUIs, and support for DOS and Windows, a united Unix might finally crack the mainstream marketplace.

by David S. Linthicum and
Steven J. Vaughan-Nichols

Windows NT or OS/2—that is the question. Or is it? As the 32-bit operating system war heats up, we can't overlook an important player in the market: Unix. It's not the Unix of years past—the one that users found intimidating. It's a new, high-powered, beautified Unix. Today's Unix systems combine a powerful 32-bit operating environment with the well-built graphical front ends that users demand. And today's Unix vendors are proposing another welcome addition: a standard. Six of the industry's top players have agreed to standardize their Unix operating systems, presenting a united front in the battle against IBM's OS/2 and the forthcoming Microsoft Windows NT.

We've all heard the stories: "Unix is slow on the PC"; "Unix is difficult to use"; "Unix is impossible to install"; "There are no applications available." Without question, Unix has a beastly reputation in the PC world, and some of



IN THIS REVIEW

Consensus V 4.2.....	234
Dell Unix System V Release 4.....	238
Interactive Unix.....	240
SCO Open Desktop.....	250
UnixWare.....	253
NeXTStep for Intel Processors.....	238
Solaris for x86.....	244

H I G H L I G H T S

Unix on Intel

IT'S TIME TO CHOOSE which 32-bit operating system will take your organization into the next century: OS/2, Windows NT, or a Unix-based system. With its historic stability and powerful new graphical interfaces, Unix is proving a viable option.

SUPPORT FOR DOS AND WINDOWS means that you can migrate to Unix without leaving your favorite applications behind. DOS and Windows support is limited, though, and varies from system to system.

COSE, the Common Open Software Environment, a set of standards recently adopted by six of the industry's top vendors, promises to unify the traditionally fragmented Unix operating system. This should help eliminate some of the confusion caused by the existence of various (and competing) versions of Unix.

those concerns are still valid. But 32-bit operating systems are on the fast track to success, and the advent of high-powered, low-priced CPUs means that more desktop users can tap into Unix's unique capabilities.

Unix, the first 32-bit operating system for machines based on Intel chips, is also one of the oldest; it was introduced almost a decade ago. Today, as an operating system it provides the additional horsepower required by many specialized applications such as CAD/CAM, imaging, real-time process control, database servers, CASE, and sophisticated software development projects. Besides its acceptance by the usual scientific users who have been sold on Unix from day one, Unix has found a home in the government (mainly the Department of Defense) and can also be spotted in financial firms on Wall Street.

You must beware, though: Unix is not an operating system for everyone or every application. You should consider a

UNIX IS A MULTIUSER system as well as a multitasking one, meaning that a single 386 machine (or preferably a 486) can do the work of a minicomputer costing 10 to 20 times as much.

ANOTHER STRENGTH of Unix is its superb networking capabilities. The engine has several built-in networking tools, including utilities for transferring files and logging in remotely. Unix networks also have excellent stability, which makes them ideal for mission-critical applications.

THE DARK SIDE of Unix cannot be ignored, however. Unix systems are still relatively tough to install and to administer, though vendors are improving these shortcomings. There are not nearly as many applications written for Unix as there are for DOS and Windows, and the system requirements can be steep, too.

move to Unix carefully before actually taking the plunge. Many of the advanced features of the Unix operating system may be a dream come true for some and a nightmare for others. What's more, the minimum system requirements that the most advanced products demand may

Many of Unix's advanced features may be a dream come true for some and a nightmare for others.

make a move to Unix quite expensive.

In this issue we look at Unix operating systems capable of running DOS applications, including Microsoft Windows and the applications written for it. The ability to provide some sort of user-friendly

graphical interface from the native Unix environment was also a criteria. The products we reviewed include Consensys Corp.'s namesake V 4.2 operating system (at the time of our testing, Consensys did not support DOS or Windows, but the version expected to ship around the same time as this article will have it); Dell Unix System V Release 4, from Dell Computer Corp.; SunSoft's Interactive Unix, Version 3.0.1; The Santa Cruz Operation's SCO Open Desktop, Version 2.0; and UnixWare from Univel. Two of the handsomest systems, SunSoft's Solaris for x86 and NeXT's NeXTStep for Intel Processors, were still in beta at the time of this review but should be shipping shortly after this article appears; both products are discussed in sidebars to our main article.

SHARED ROOTS

Unix is a highly modular and open system that has evolved over time (see the sidebar "Unix's Non-Intel Heritage" for more information). The most common Unix kernel, or engine, is currently based on the Unix put out by Unix System Laboratories (USL). The newest versions are System V Release 4 (SVR4) and subsequent maintenance releases to SVR4.2 (which is also called Destiny). At the time of its release, SVR4 was the pinnacle of the movement toward a single, united Unix. It was designed to combine all the virtues of the disparate members of the Unix family into one operating system.

SVR4 combines the best features of the Berkeley Standard Distribution (BSD), SCO's Xenix (an early x86 Unix variant), and AT&T's System V Unix.

All of the products we tested, with the exception of Interactive, NeXTStep, and SCO Open Desktop, are based on either SVR4 or Destiny. (NeXTStep uses the Mach kernel; Open Desktop and Interac-

Our Contributors: STEVEN J. VAUGHAN-NICHOLS is a contributing editor to *Computer Shopper* and the head of Vaughan-Nichols & Associates, a computer consulting firm. DAVID S. LINTHICUM is a Unix OS expert currently working for Mobil Oil Corp. HEIDI PATTON is an editorial assistant at Vaughan-Nichols & Associates. NOEL-MARIE TAYLOR is a free-lance writer and a technical writer for Ki Research, a networking and interoperability company. MARK WALLACE is a computer security specialist and a free-lance writer.



▶ EDITORS' CHOICE

• **UnixWare**

tive use an earlier System V kernel.) USL licenses its Unix code to vendors, which then revamp and resell the product. Each adds enhancements to make its particular offering more attractive to potential buyers.

Dell, for one, invested so much time and effort into enhancing the SVR4 engine that it opted not to follow USL's upgrade path to SVR4.2. But while some vendors, like Consensys Corp., have done relatively little to differentiate their products from the original USL kernel, others, like NeXT, have created environments that have little in common with the Unix legacy.

Tracing Unix versions back to their USL origin doesn't always tell you much about the system features. For example, Open Desktop, even though it's based on System V Release 3.2, provides many of the features found in System V Release 4.2. This has led to some "version confusion" among potential Unix buyers. When making a buying decision, you need to examine the features first and the Unix heritage second.

GETTING COSE-y

Unix vendors have recognized that such disparity lessens the appeal of all Unix systems. With IBM's push behind OS/2 and Microsoft's larger-than-life launch of Windows NT, Unix makers are preparing an offensive of their own. HP, IBM, SCO, SunSoft, Univel, and USL have agreed to support the Common Open Software Environment (COSE) to unify the fragmented Unix OS.

The environment would standardize Unix components ranging from the GUI and networking aspects to graphics and multimedia. Whether this latest attempt to bring a higher order will succeed—and where it will leave non-COSE vendors, such as NeXT—remains to be seen. Still, this is an important salvo in the war for the desktop.

THE CASE FOR UNIX

Why should you consider Unix the operating system that you should ride into the next century? The foremost and most convincing reason is that the operating system has built-in multitasking capabilities. Of course, Windows NT and OS/2 both have this ability, but Unix goes them

With the "open" Unix effort moving ahead at full tilt, trying to predict a winner in this race is like trying to guess how many jellybeans there are in a jar. For an operating system that's been around as long as Unix has, its strength as a GUI environment on

the Intel chip-based desktop is still a fairly unknown and untested quantity. Of the products we looked at, the Unix system that seems to have the best grasp of the Intel market is Univel's UnixWare.

UnixWare offers end users a well-implemented blend of multitasking, multiuser, and networking capabilities (both TCP/IP and NetWare). It provides excellent DOS compatibility and a solid GUI. Add to the blend an aggressive price and professional end-user documentation and you've got the elements of a winner.

Of course, all of the Unix systems reviewed here have their strengths. Visix's Looking Glass running on Interactive Unix or SCO Open Desktop gives you a great GUI environment. Consensys offers cutting-edge multiprocessing. Dell adds a ton of Unix freeware and the benefit of a tightly integrated hardware environment.

one better: It is also multiuser. This means that a single 386 or better PC can support as many as 120 users simultaneously, in much the same manner that a minicomputer (like the DEC VAX) can. All of the processing takes place in the PC on a single CPU.

The users are connected by means of asynchronous connections, using terminals to communicate with the operating system and applications. This type of connection is usually facilitated by a multiport board that allows the computer to accommodate additional serial connections beyond the standard COM1 and COM2. Using a high-end 386 or 486 PC with a large amount of RAM (16MB or more), you can create a surprisingly fast

It alone combines all of these into one package. UnixWare successfully connects the strengths of a technically superior Unix with DOS and NetWare. The DOS/NetWare integration opens the door to running a good portion of the existing DOS and Windows applications.

A hearty honorable mention goes to NeXTStep. Although NeXTStep wasn't ready for full testing at the time of this review, its object-oriented environment, impressive display graphics, and multimedia prowess make it the type of product toward which we should all be moving. Another product, SunSoft's Solaris, clearly has impressive networking capabilities. In addition, Solaris offers cross-platform integration with Sun's technologically advanced SPARC platform. Again, we'll have to reserve judgment until the company's distributed-computing model is fully implemented.

multiuser computer that can rival minicomputers costing 20 times as much.

It's impossible to overstate the benefits of a true multiuser, multitasking environment. A system administrator can connect into your system to solve a problem without shutting down all operations; users can invoke an application, get e-mail, or just receive a file without disturbing others on the system. They can even dial into their system from home by using the facilities of Unix: No matter what other tasks the system is performing at that particular time, Unix still makes time to answer the phone, connect, and provide a system log-on prompt. All the reviewed Unix products support many simultaneous users and multiport boards.

Suitability to Task

It's a big commitment, but moving to a Unix environment may make a lot of sense for your organization. You can reap the benefits of a true 32-bit multitasking operating system without sacrificing the creature comforts of a GUI or leaving your favorite DOS and Windows apps behind.

Networking reflects a system's ability to communicate via different networking standards, and the ease with which you can install and configure communications options. Unix has a strong tradition of network communications, and all the systems deserve praise in this area. Products that received the highest scores were easier to network or were able to communicate via additional protocols.

DOS environment indicates the ease and power of interoperability with legacy DOS systems. This ability is crucial for organizations that want to convert from existing DOS systems to Unix workstations.

The **GUI integration** rating indicates how seamlessly and elegantly the GUI meshes with Unix. A system should permit a user to accomplish nearly all tasks from within the GUI, without resorting to the command line. A rating of *excellent* means that the GUI was powerful and elegant enough for us to prefer it to the command line.

A further strength of the Unix system is its unparalleled portability. Because it runs on so many different platforms, Unix is often the only choice for organizations that need to deliver multiplatform software and support to their users. Although the executables themselves can't be transferred from one Unix hardware platform to another (for example, from RISC to Intel), the program source code developed under Unix—usually C—can be moved from platform to platform with few modifications. Therefore, applications developed on a PC can be ported to other hardware platforms that run Unix (for example, DEC VAX, Sun, and IBM RS/6000). And porting an application from one version of Unix to another is even easier. This is why a software package available for one version of Unix is usually available for many others as well. Of the systems we reviewed, UnixWare stands out for its superb cross-

SUITABILITY TO TASK				
Product Name	POOR	FAIR	GOOD	EXCELLENT
Networking				
DOS Environment				
GUI Integration				
Administration				
Multitasking	N/A			

Unix workstations are powerful beasts and require maintenance. For the **administration** category, we evaluate how much maintenance is required and how well the system facilitates that maintenance. We consider the system administration tool that each product provides, as well as the utilities for installing new software. Products that scored highest in this category let users perform some if not most administration tasks through the graphical interface.

Unix is designed from the ground up to be a **multitasking** operating system. This rating represents how well the system performed under a variety of process loads (the number of jobs running on the system), and how much protection the system offered against the perils of multitasking. A higher score means that the system not only performed well under most conditions, but it also protected against more uncommon sources of disaster.

platform integration.

Application developers further benefit from the accommodating environment that the operating system provides to software developers. The software development tools that are available on most Unix systems include many powerful utility programs and other facilities that make application development on Unix a breeze (for more information, see the sidebar "Unix Development Tools").

For end users, the potential of Unix can be best realized by the several hundred utility programs that are available. Although many of the utilities are moored in rather cryptic commands, once you learn them they are quite powerful, particularly when performing such activities as text processing, file management, and even modem communications.

We should also note that all the Unix versions reviewed give the lie to the base canard that Unix is unstable. Interactive

took abuse above and beyond the call of duty better than the others, but all of them are rock-solid under normal or even slightly abnormal conditions.

EASY, STABLE NETWORKS

Unix is also designed for easy network use, especially with the release of SVR4.2, for which USL made a point of enhancing the networking capabilities. SVR4.2 allows network administration to be performed across the network, and network service requests from remote machines to be handled by a new "port monitoring system." Even multiprocessing tools are built into the operating system, allowing processor workloads to be shared across a network.

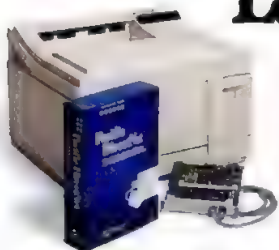
Unix has several built-in networking tools, including ftp (file transfer protocol), rlogin (remote login), rfc (remote file copy), TCP/IP, and uucp (Unix-to-Unix copy). Additionally, Unix has powerful network add-ons available, such as the peer-to-peer NFS (Network File System), the less popular RFS (Remote File System), and the new AFS (Andrew File System) built for wide area network use. These add-ons allow users to share file systems and network resources such as laser printers, CD-ROM drives, and modems. All of the Unix versions reviewed here support at least one of these network protocols.

Many DOS-to-Unix networking solutions are now available and supported by major network vendors. Univel, a Novell subsidiary, makes products that connect out of the box to NetWare networks. Other solutions, such as DOS-based NFS systems, let DOS-based PCs connect to the NFS Unix network.

Because Unix can accept additional low-level device drivers and offers a flexible file system, multitasking capabilities, and a large base of communications software, it is a natural for networking. Certainly it's in the running with Windows NT and OS/2. In addition, Unix systems don't crash easily, making them an especially good choice for mission-critical computers such as file servers and database servers. Program errors that ordinarily would send OS/2 and Windows into a "hard lock" would wipe out only a single Unix process, allowing other processes on the system to continue.



Pacific DirectNet. It teaches your LaserJet® to look both ways.



Until now, most network interface cards for the LaserJet could only look in one direction. And over time, that restriction proved to be inefficient and costly.

Now there's Pacific DirectNet™ from Pacific Data Products. With it, your LaserJet printer can connect to Novell® networks alone. Or to both Novell and TCP/IP networks simultaneously. And, Pacific DirectNet lets you locate a printer anywhere on your Novell or TCP/IP LAN. That means the printer will be located where it's needed. Not where the file server happens to be.

At Pacific Data Products, we recognize that your networks are constantly changing and growing. That's why we made Pacific DirectNet user upgradeable. Novell-only cards can be easily upgraded to support both Novell and TCP/IP, as well as new network operating systems or NOS revisions. With this capability, your investment in Pacific DirectNet is always fully protected.

FEATURES INCLUDE:

- ▶ Compatible with Novell NetWare® 2.2 and 3.11, as well as all Sun®, HP®, and other UNIX® Ethernet networks which support TCP/IP network protocols and LPR/LPD, TFTP, and FTP printing protocols.

- ▶ Simultaneous support for multiple Novell PSERVER, RPRINTER, and TCP/IP print connections.
- ▶ Novell features — Supports PSERVER, the fastest printing mode in Novell. Provides maximum security with encrypted passwords for Netware 3.11. Easy-to-use, Novell auto-setup software included.
- ▶ TCP/IP features — Broad cross-platform support with LPR/LPD, TFTP, and FTP print protocols. No additional host workstation software required. Easy setup using standard UNIX protocols, BOOTP, RARP, and UNIX operating systems utilities.
- ▶ Contains 512KB of base memory which is user upgradeable to 4.5 MB for optimum performance in complex network environments.
- ▶ Versions available for LaserJet 4, IIISi, III, IIID, PaintJet® XL300, and DesignJet® plotters.
- ▶ Includes lifetime warranty, 60-day money back guarantee of satisfaction, and unlimited technical support.
- ▶ Novell version available for \$499 U.S. list price. Novell and TCP/IP for only \$699!

If you'd like to teach your LaserJet to look both ways with Pacific DirectNet, call Pacific Data Products at (619) 625-3606, Fax (619) 552-0889.



**PACIFIC DATA
PRODUCTS**

A DCA COMPANY

Pacific Data Products, Inc. 9125 Jethco Rd., San Diego, CA 92121. In Europe, call (353) 61 475609. Pacific DirectNet is a trademark of Pacific Data Products, Inc. HP, LaserJet, PaintJet, and DesignJet are registered trademarks of Hewlett-Packard Co. Novell and NetWare are registered trademarks of Novell. Unix is a registered trademark of AT&T System Laboratories, Inc. Sun is a trademark of Sun Microsystems, Inc. IBM and AIX are trademarks of International Business Machines Corp. Ethernet is a trademark of Xerox Corp. All other brands and product names are trademarks or registered trademarks of their respective manufacturers. © 1993 Pacific Data Products, Inc.

Unix's Non-Intel Heritage

by David S. Linthicum

The Unix operating system has been running on computers for nearly 25 years. Although the Intel x86 market has boosted the use of Unix on workstations, it is the non-Intel platforms such as RISC, SPARC and others that provide the processing power for the majority of Unix-based computers in use today.

UNIX PAST

Unix's origins can be traced back to 1969 and a pair of AT&T programmers named Ken Thompson and Dennis M. Ritchie. Unix Edition 1 was born when they created a single-user operating system to run Space Travel, a game on a DEC PDP-7 computer. They wrote Unix in C, a brand-new and shaky programming language. But because the C language is highly portable, it wasn't long before versions of Unix were created for other processors.

The evolution of Unix became complex when Unix divided into several distinct "flavors" for different hardware platforms. The Xenix flavor of Unix, from Microsoft Corp., became one of the first to run on Intel microprocessors. The BSD version, devel-

oped at the University of California at Berkeley, found a home on many high-powered minicomputer platforms. Unix 2.0, the predecessor of the currently popular System V Unix from AT&T, re-

Also, notice how versions were combined to form new flavors of the operating system. Combining releases to form a hybrid seems to be the current trend, apparent in the newest release, SVR4.2.

Notable Unix flavors include AIX as well as the IBM RS/6000 operating system; OSF/1, from the Open System Foundation; Solaris, from SunSoft (see the sidebar on Solaris); and Mach (the basis of NeXTStep, which is discussed in a separate sidebar).

UNIX PRESENT

The fight is on: Who is going to process Unix on the workstation? (See the related platform story elsewhere in this issue.) When RISC processors first came onto the market several years ago, they became the Unix "power" platform. The multiuser, multitasking Unix operating system required much more than the Intel processors could offer. Unix hardware and software vendors (such as MIPS, DEC,

Sun, and Data General) rushed to deliver Unix-based workstations powered by new RISC processors; they caught a good portion of the high-end Unix workstation market. And the processor continues to evolve, boasting such

The Unix Family Tree



ceived the most attention and is today's standard for Unix systems based on Intel chips.

The diagram shows the Unix family tree from 1969 through today. Notice that Unix splits into several releases.

X WINDOW OF OPPORTUNITY

The most important trend in the Unix arena—one essential for Unix to become a mainstream operating system—is the evolution of Unix's GUI environment. Enter X Window, which provides the standard user-interface development environment that most of the Unix systems on the market support. X Window is a set of programming tools for controlling how information is moved and retrieved on a graphical display. Like Unix itself, X Window provides excellent portability from one platform to the next. This porta-

bility makes it easier and less expensive for vendors to supply front-end GUIs with their Unix systems. Except for NeXTStep, all the products reviewed here use X Window as the foundation for their GUIs.

While the behavior of windows is governed by the X Window standard, their appearance is not. That's where window managers like Motif and Open Look come in (Open Look is SunSoft's proprietary manager, which will be phased out under the COSE agreement). Window managers refine the Unix system's be-

havior and define its appearance. These managers are the bricks and mortar from which true GUIs can be built. And while some vendors will sell you "GUIs" that consist merely of the basic X Window system and a windows manager, these alone do not a GUI make. To match the full functionality that OS/2 or Microsoft Windows provides, you'll also need a desktop manager.

All of the products reviewed here have some sort of desktop manager. Some companies provide their own desktop managers to bind the X Window sys-

RISC-like features as superpipelining, two-level cache memory, and an on-board translation look-aside buffer (TLB). The new RISC CPU boast external clock speeds of up to 75 MHz and internal clock speeds of over 150 MHz with a 62-bit data path.

Intel processors are becoming more RISC-like, though. The new Pentium chip from Intel reputedly operates at over 100 MIPS, almost twice the speed of the 486DX2. Not surprisingly, this processor supports 32-bit and 64-bit data paths, and RISC-like features such as superscalar architecture and an advanced floating-point unit (FPU). Many former non-Intel Unix vendors (such as SunSoft, NeXT, and the Apple-IBM alliance) are now porting to Intel.

UNIX FUTURE

Even with the advances Intel made with the Pentium chip, the RISC vendors have managed to keep just a few steps ahead in CPU performance. But not without a price. Though prices are falling as competition with high-end Intel designs heats up, a fully configured Unix RISC workstation can still cost upward of \$15,000.

When all is said and done, the future of Unix on non-Intel platforms may rest with Intel. Even if Intel is a few ticks slower than RISC, the tons of software one can purchase for an Intel-based system—including the Unix operating system and Unix applications—may make Intel the best value in the Unix arena of the future. □

tem together and give users a complete GUI, while other companies use third-party desktop managers. Dell and SCO, for instance, use IXI's X.desktop; for Interactive, SunSoft uses Visix Software's Looking Glass. The overall result is the same: a GUI that's as fully functional as those in the IBM or Microsoft operating systems. But be warned: The system resources that these GUI delights require are steep—typically higher than the resources you need for running Windows.

Unlike Microsoft Windows or OS/2 Presentation Manager, X Window is a

network windowing system based on the client/server model. The system is divided into three parts: the display server, the client application, and the protocol linking them together. Programs can be executed on a remote computer and the results displayed on a local X Window server.

The display server facilitates client display capabilities, keeps track of user input and client application programs, and also acts as an intermediary between client application programs and the local display hardware. The client application makes requests to the server.

This division in the X Window architecture allows the client applications and the display server to work together on the same machine or to reside on different machines that are connected by a local network. Since X Window terminal emulators are available for Microsoft Windows and DOS, DOS-based PCs can operate an X Window server and act like an X Window terminal.

X/Open, an association of many computer manufacturers who support the X Window standard, spends a great deal of time and resources controlling the quality and compatibility of the standard. This is important, since so many GUIs depend on X Window. It's also important to note that the X Window system is not part of any operating system but instead consists entirely of "user-level" programs. This fact alone makes X Window very open and portable. X Window is not exclusively a Unix product; it can and does run as easily on VAX-VMS or DOS (for example, under Quarterdeck's DESQview/X) as on Unix.

KEEPING THE DOS GUYS SATISFIED

In order to satisfy their Intel-based clientele, Unix, OS/2, and Windows NT are all able to run DOS and Windows applications as a compatibility option—some more successfully than others. While Unix proper can't run either DOS or

Windows applications, the 32-bit environment offers a way out of this by enabling the operating system to run virtual 8086 and 286 machines.

In this feat of computing magic, a mapped protected mode of the Intel 386 or better processor can be used to set up an environment for any application, including an operating system, that it is running in its "own" 8086 or 286 computer. EMS memory emulation is even supported for DOS applications that require it. What this means in practice is that you can run real DOS in windowed or full-screen environments with software like Insignia Software's SoftPC, Locus Computing Corp.'s Merge 386, and Phoenix Technologies' VP/ix. As long as your application software doesn't test DOS's limits (like Lotus 1-2-3, Release 3.1, does by using a rather pushy DOS extender), your apps should run just fine.

DOS applications that access the devices directly may also cause problems. For example, just because your network adapter can connect to a NetWare server from DOS does not mean that you can do the same under Unix using a DOS emulator. You may also run into unpleasant surprises if you try to run Windows 3.1 in Enhanced mode on currently available Unix systems because Windows itself would be in direct conflict with Unix for control of the processor.

Windows 3.1, in many cases, can be run in these environments in Standard mode, which is tolerable. (OS/2 manages to run Windows in Enhanced mode because IBM has access to Microsoft's Windows code.) All DOS emulators can run Windows 3.0 in Real mode, but doing this limits the number of Windows applications you can run, since many do not support this operating mode. The bottom line: You should not purchase Unix to run DOS per se, but converts from DOS and Windows will be happy to know that they do not have to leave their favorite applications behind.

*X Window is not
part of any OS,
consisting
entirely of
"user-level"
programs. This
fact alone makes
X Window very
open and
portable.*

Exactly how fast is graphics performance Image™ Series PCs?

Let's just say we developed Image Video™ technology expressly for all you high-performance speed demons. Fact is, we've engineered our Image™ Series PCs with a power-



NEC has the ultimate system for graphics applications: lightning-quick Image Series PCs with integrated SCSI II interface, legendary MultiSync FG monitors, and our pioneering CD-ROM readers with MultiSpin™ technology.

ful combination of our second-generation local bus and graphics accelerator, allowing graphics information to travel directly between the CPU and video memory, so

Windows™ is a breeze and you can sprint through today's most demanding graphics applications.

Based on Intel's powerful 486 chip, each Image Series PC has OverDrive™ capability for easy processor upgradability. An on-board SCSI II interface means you can quickly connect to a wide variety of peripherals. And with our new OptiBus™ technology, your peripheral performance is up to 30% faster than ordinary systems. We've even made it easier for you to network



your PCs with an optional factory-integrated, high-performance 10BaseT Ethernet® adapter.

Plus, every Image Series PC is designed with True Color support of up to 16.8 million colors for photo-realistic images, as well as our exclusive ImageSync™ technology for flawless performance when connected to our award-winning

MultiSync® FG™ series monitors. The result? Clear, flicker-free images without any adjusting.

So call 1-800-NEC-INFO (in Canada, 1-800-343-4418), or NEC FastFacts™ at 1-800-366-0476 (#IMAGE). Then hold on to your spots.

Because ↑ is the way you want to go.

NEC

the ce of NEC's





The Light Bulb 1879



Aspirin 1899

The best inventions make you won

MultiSpin™ from NEC.

Thanks to pioneers like Thomas Edison, you don't remember what it was like to read by candlelight. And thanks to NEC's MultiSpin™ CD-ROM readers, you won't be able to remember a time when you couldn't transfer

data at a rate of 300 KB/second.

We revolutionized CD-ROM.

NEC was the first company to successfully bring dual-speed technology to market, and now has a complete family of readers designed to fit your needs. From our external MultiSpin 74 and internal MultiSpin 84, to our lightweight, portable MultiSpin 38.



The Refrigerator 1913



NEC MultiSpin CD-ROM Reader 1992

der how you ever lived without them.

Built for the future.

All of our readers support Kodak's Multisession Photo CD™ technology, so you can view photographs on

CD and work with those images on your computer. All are SCSI 2 compatible, which increases compatibility across multiple platforms.

And both the MultiSpin 74 and 84 have a 256 KB continuous flow cache that allows them to transfer encyclopedias of

data at high speeds and play back video without any pauses in motion. And the MultiSpin 38 gives you the power of portability. Best of all, they all come with a two-year warranty.

Multimedia's never been so easy. What's more, all of them are QuickTime™ compatible and meet the Multimedia PC (MPC) standards for Multimedia computing. Once you

check out the high-performance CD-ROM readers from the pioneers of

MultiSpin technology, you'll find everything else about as primitive as traveling by horse and buggy. To find out more, call 1-800-NEC-INFO (in Canada 1-800-343-4418).

Or, via fax, call NEC FastFacts™ at 1-800-366-0476, request #23766.



Because ↑ is the way you want to go.

NEC

CIRCLE 153 ON READER SERVICE CARD

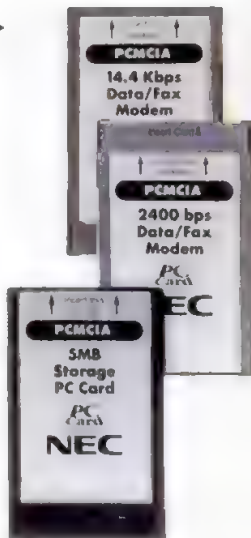


In 1985 NEC redefined monitors with the invention of MultiSync® technology. Now there is MultiSpin. The technology that has redefined CD-ROM readers.

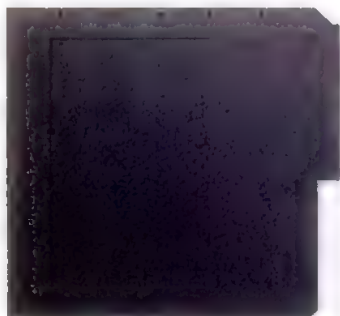
What will people make of Anything they want.

Versa's screen detaches easily, so you can quickly upgrade it, reverse the display or convert to pen.

For the ultimate in expansion and connectivity, Versa offers the latest PCMCIA Type III standard: plug in up to two cards—modems, LAN, storage or, in the future, wireless networking. What's more, our QuickSwap™ feature lets you change cards in mid-application without powering down.



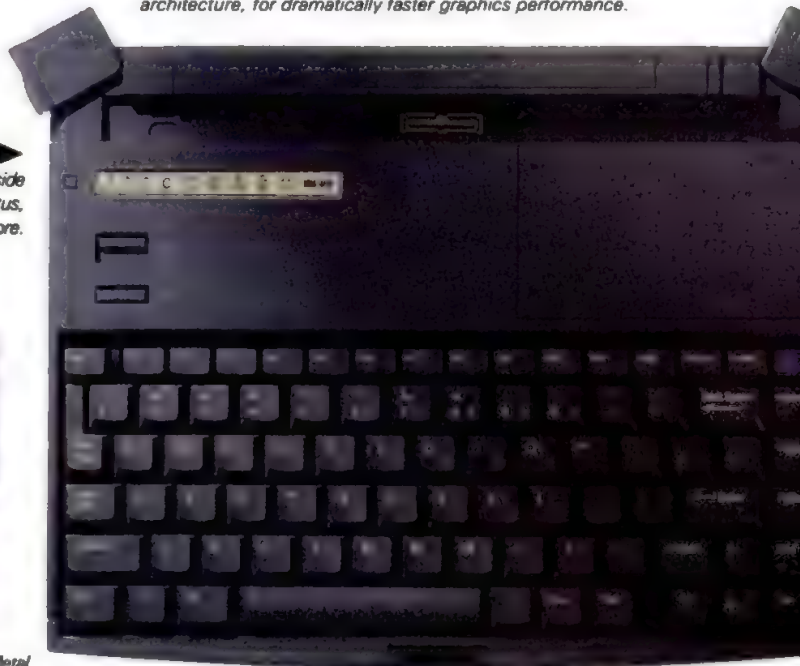
The LCD status panel gives a quick overview of what's going on inside your Versa—power management status, battery life and more.



Versa comes standard with a Nickel Metal Hydride (NiMH) battery, for longer life and quick recharging.



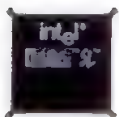
Choose Versa with 256 brilliant colors and the latest active-matrix screen technology, or with 64 crisp shades of gray. Either way, Versa is the first notebook to use local bus video architecture, for dramatically faster graphics performance.



our new UltraLite® Versa™?



▲ Versa's RAM can be easily upgraded from 4MB to as much as 20MB† simply by sliding in a memory card.



▲ Versa offers powerful, energy-efficient 3.3V i486SL™ processing. Start with your choice of 20, 25 or 33MHz‡ processor; upgrade as your computing needs increase.



As with our award-winning monitors, printers, desktop PCs and CD-ROM readers, the new UltraLite Versa is a prime example of what NEC does best: integrating many new technologies into one seamless, highly functional package.

▼ Versa offers innovative active-matrix color pen computing, as well as a monochrome pen model. Versa also converts to a tablet in seconds, for capturing signatures, taking notes or annotating presentations.



▲ To increase Versa's storage capacity, just choose from 80MB, 120MB or 180MB removable hard drives. And Versa comes pre-loaded with Windows™ 3.1 and DOS® 5.0.



▲ With our new DoubleTime™ technology, Versa's battery life can be doubled, instantly, by exchanging the floppy drive for a second battery. Result: an astounding 8-12 hours for monochrome, 5-10 hours for color, depending on usage.

The new UltraLite Versa is perhaps the one notebook computer you should want right now.

That's because Versa's exceptional upgradability and flexibility give you the power to choose the system you need today, and then enhance its features as your needs change.

Making it a notebook you'll *still* want years from now.

With Versa, you're protected from wasting money on a notebook you might soon outgrow. Protected, too, by a 3-year limited warranty and UltraCare™ enhanced service plan.*

The 6-lb.** Versa is a light, powerful i486SL™ notebook that's perfect for heavy computing, faxing and communicating while on the road.

Giving you a real alternative to the mouse, Versa's optional pen models and pen upgrades† make it easy to take notes or enter data in the field.

Slipped into its optional Docking Station™ unit, Versa offers all the capabilities of a desktop computer. So what do you make of a notebook PC that does all that? Anything you want.

For details on the amazing UltraLite Versa, call 1-800-NEC-INFO (in Canada, 1-800-343-4418), or NEC FastFacts™ at 1-800-366-0476 (#ULVERSA).

Because ↑ is the way you want to go.

NEC



Performance Tests: 32-Bit GUI Unix

Our performance tests, which simulate a real-world environment, revealed relatively slight differences among the various Unix systems. To put the performance of Unix systems in perspective, we wish to point out that a single-user implementation of Microsoft Windows running on top of DOS bests these Unix versions in terms of speed. But this is to be expected: As a multitasking, multiuser operating system, Unix does a lot more at any given moment than Windows does.

What the Numbers Mean

The numbers indicate that all of these systems are adequate performers: None of them will have users tapping their fingers impatiently. UnixWare was the slowest of these systems, but as we noted earlier, the time differences between the slowest and the fastest systems are very small. Also, as we moved from a single user on the system to five users, these Unix systems showed only a relatively slight degradation in speed—a testament to Unix's ability as a strong multiuser operating platform.

We should add that at present, there is no foolproof way of measuring 32-bit operating-system performance between disparate operating systems. Low-level benchmark tests such as Dhrystones (which measures integer mathematics) tell us more about a processor's performance and a compiler's efficiency when it comes to a particular machine architecture than it does about the operating system. And unfortunately, high-level, application-oriented benchmark tests suffer from the problem of not being reproducible. What the numbers do give us, however, is an overall impression of the relative speed at which mainstream applications will perform in each environment.

We should also note that any of these systems could doubtlessly perform better with intensive tuning. Unlike DOS machines, Unix systems have a wide variety of parameters that are especially sensitive to how RAM is allocated. We tuned all these systems to the same settings. If you purchase one of these products, we advise you to pick up a copy of *System Performance Tuning*, by Mike Loukides (ISBN: 0-937175-60-9). We believe that you can squeeze at least 10 percent more performance from each of these systems if you configure them to their optimal specifications.

How We Tested

We ran these tests on a Compaq Deskpro 486DX/33 system with 16MB of RAM and a 330MB hard disk. We also equipped our test system with an EISA motherboard and standard Compaq Super VGA graphics.

We asked each vendor to come up with the word processing and spreadsheet applications that it believed would perform best on its operating system. Without exception, each vendor chose WordPerfect for Unix Systems, Version 5.1, and Lotus 1-2-3 for Unix System V, Version 1.1. Both of these applications are X Window-based implementations created for Unix platforms. We ran each of our tests three times, timed the results manually, and computed an average.

Because OS/2 2.1 and Microsoft Windows NT were not yet available at the time of our testing, we choose to look at Windows for Workgroups for performance comparisons. Windows for Workgroups is a peer-to-peer workgroup GUI environment that is functionally similar to Unix in many ways. For the Windows tests, we used Lotus 1-2-3 for Windows, Version 1.1, and WordPerfect for Windows, Version 5.2.

Our test suite included portions that tested how quickly each Unix system launched Lotus 1-2-3 and WordPerfect from the GUI. Since the differences among the times were insignificant—Lotus 1-2-3 typically took less than 1 second to load and WordPerfect around 2 seconds—we chose not to present these results in a separate graph.

For the Lotus 1-2-3 **Matrix Multiplication** test, we set up two matrixes of six-digit numbers; each matrix is 30 cells by 50 cells. We then have Lotus 1-2-3 multiply each number by its counterpart, located in its twin matrix, to produce a third matrix. The scores show the time each operating system took to complete the task.

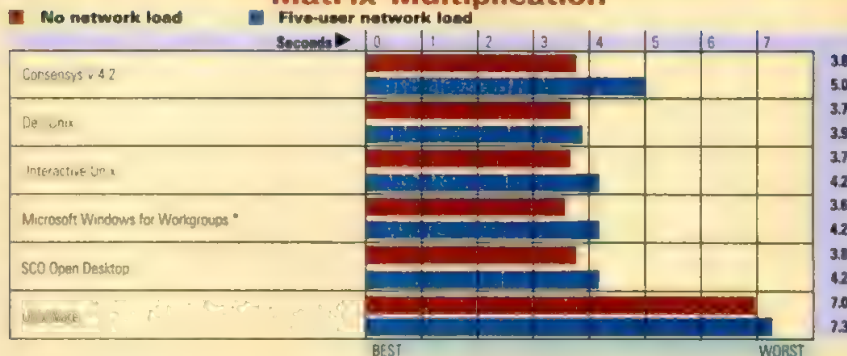
For the Lotus 1-2-3 **Loan Calculation** test, we have Lotus 1-2-3 determine the monthly payment on a 30-year mortgage at x interest for y amount. We insert values and time how long it takes for the application to calculate the amount.

The WordPerfect **Spell-Check** test score is simply the time a system took to spell-check a 20K test file under the application.

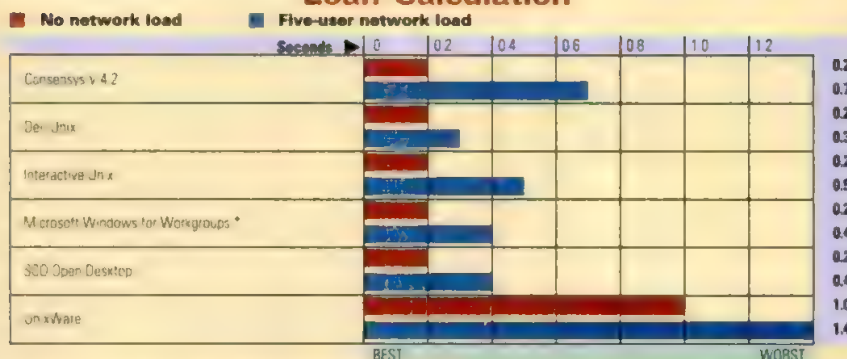
For the WordPerfect **Sort and Shuffle** test, we run a macro that flips the last paragraph of our test document to the first-paragraph position, the second-to-last paragraph to the second-paragraph position, and so on until every paragraph had been moved.

LOTUS 1-2-3

Matrix Multiplication

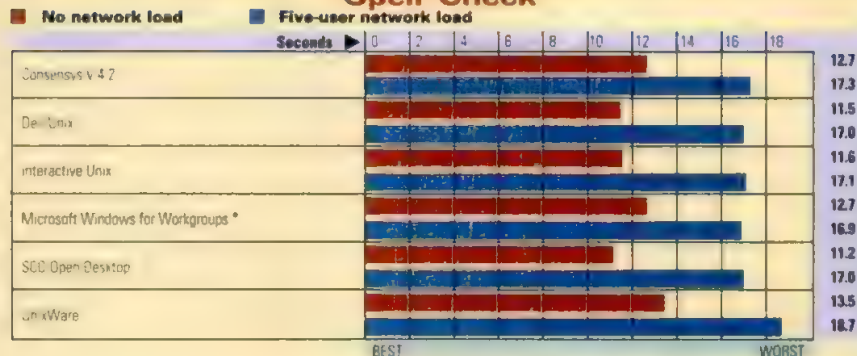


Loan Calculation

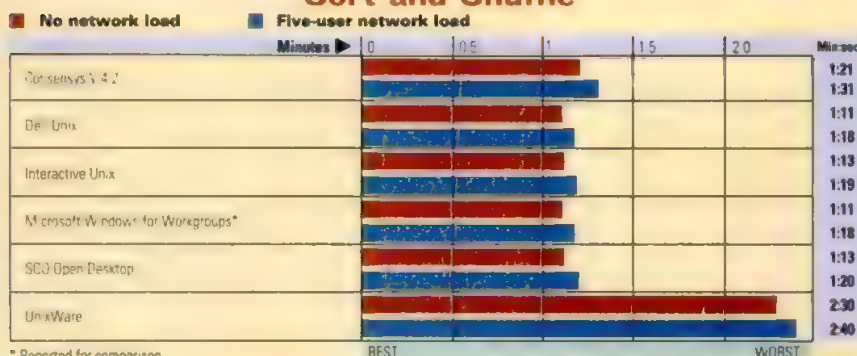


WORDPERFECT

Spell-Check



Sort and Shuffle



* Reported for comparison

UNIX'S DARKER SIDE

Unix never won the hearts and minds of many x86 users for several reasons. First, raw character-based Unix is not built for humans. Users found the cryptic two-character commands and lack of usable help frustrating. Second, compared with good ol' DOS, Unix is a resource hog: Most of the products reviewed here each need at least 8MB of RAM and as much as 100MB of disk space just to get the operating system and GUI up and running. You are going to need at least a 386DX-based PC to get by, and in many cases a 486 is recommended to handle the Unix beast. While this same gripe applies to Windows NT and OS/2, there's no getting around the fact that the resource requirements alone make Unix a little too expensive for some.

Installing a Unix system can be a chore, and administration can be a bear. And although Unix shrink-wrapped software is no longer the oxymoron it once was (for years Unix programs had to be recompiled on every new system), installing programs to work to your best advantage can be a pain in the neck. Once properly set up, however, a Unix environment is as robust and easy to use as any other mainstream operating system.

Another black mark against Unix is that it is not as application-rich as DOS and Windows. While there are vertical-market applications galore, only a few of the major software vendors have embraced Unix. So, for example, you can get WordPerfect but not Ami Pro. You have Lotus 1-2-3 but not Microsoft Excel. It's this limited choice of applications that does Unix in for many markets. OS/2 suffers from the same problem, and the jury is still out on Windows NT.

Performance is also a concern. From the user's perspective, Unix appears to run more slowly than do Windows or OS/2 on the same architecture. The explanation from Unix vendors is that Unix is just doing more at any given time. This is true. Unix is constantly running scheduling programs, printer spoolers, and other maintenance software. Still, that won't stop anyone who is used to the speed and snap of a single-user operating system from drumming his or her fingers impatiently. As the GUIs get more sophisticated and as additional features

such as security are added, Unix is likely to get even slower. The hope for Intel-based Unix products lies with the new pumped-up processors such as the Pentium chip, which helps bring RISC-like processing power to the desktop more affordably.

When evaluating the cost of a Unix system, sticker shock is not uncommon. But while the price tag might seem out of line at first glance, when you add in the cost for all the additional software to achieve the same functionality, Unix may be a bargain. All the Unix systems we looked at come with a host of utilities—e-mail, schedulers, and so on—that other operating systems don't supply. Many of them also bundle features such as development systems, network software, and GUIs.

Dell, for one, includes a host of freeware and the development system in the basic set. Interactive has created several bundles that the Unix shopper can pick and choose from. You can select from a simple get-you-going Unix to a major network development platform with all the bells and whistles. The cutting-edge products go this approach one better by offering system-unique improvements beyond the basics. NeXT-Step, for example, has *multimedia* e-mail.

If you are going to support more than one user, make sure you find out how the different Unix vendors handle the multi-user capability of Unix. Some allow you an unlimited number of users, while some limit you to only one or two, with an option to support additional users at an additional price. Make sure you question the vendor as to what comes with your Unix product. Also, with the arrival of Windows NT, prices should start to drop. Univel, for example, recently reduced prices on its various UnixWare editions to grab some market share.

OF DOS AND DRIVERS

Hardware support is another force with which Intel chip-based Unixes must

reckon. With hundreds of peripherals and add-ons such as video, disk, and network devices—and far too few standards—matching compatible hardware with an operating system becomes difficult. The problem is exacerbated for 32-bit operating systems, since the device drivers can't use the 16-bit BIOS. It's up to the end users to make certain that the specific hardware drivers they need actually do exist.

In the Intel-based Unix world, device compatibility is always a problem, but things are getting better. Generally, Unix products come with a certain number of standard device drivers such as low-resolution VGA, ESDI, SCSI, and IDE disk drivers; Logitech and Microsoft mouse drivers; and a smattering of additional supported devices such as cartridge tape drives and multiport boards. Interactive, for one, includes the drivers for several brands of high-resolution video adapters, network interface cards,

tape drives, and multiport boards. If the device is not supported by the operating system vendor, then the device vendor must supply the driver. This makes some of the inexpensive network cards, video cards, and other devices poorly suited for Unix, since many may not provide the Unix driver support.

CHOOSING A PATH TO THE FUTURE

As you read the Windows NT and OS/2 stories that accompany this section on Unix, you'll see that Unix is not the only—nor the most notorious—32-bit operating system vying for the spotlight. Unix continues a slow but definite penetration into the PC world, and there are those who believe that the capabilities, power, and potential of Unix will make it the operating system of the fu-

ture. It's not for everyone; it's not even for the majority. But for small and large businesses looking for a true multitasking, multiuser OS with superb connectivity, multiplatform support, and mission-critical stability, the commitment to Unix is a viable option.

Consensys Corp.

Consensys V 4.2

BY NOEL-MARIE TAYLOR

The two reviewed products that are based on USL's latest SVR4.2 kernel are Consensys V 4.2 and Univel's UnixWare. But while the products share a common foundation, their makers have taken different paths. Whereas Univel has created a hybrid operating system aimed at a specific class of user, Consensys Corp. has taken a "no-frills" approach. The basic package is a great value, and the additional modules provide room for growth.

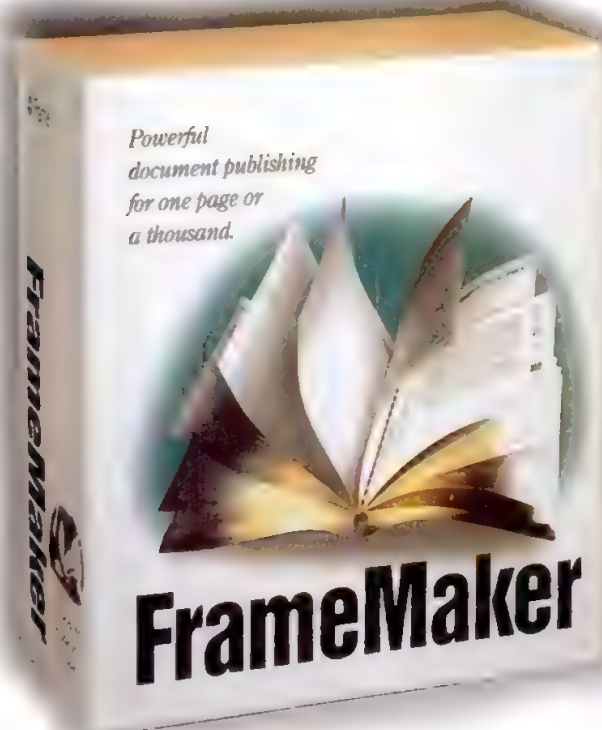
Consensys was the first SVR4.2 Unix to be released for the x86 processor. Because it's a standard SVR4.2 Unix, Consensys is compliant with the Intel Binary Compatibility Standard 2 (iBCS2). This means that you can run not only System V binaries, but also SCO Unix and SCO Xenix programs. Consensys has a number of attractive value-added modules, including C2-level security and X Window programming tools. Though the reviewed version lacked a DOS emulator (you can buy emulators from third-party vendors), the release that will be available as you read this will have one.

Though it doesn't offer the NetWare

compatibility of UnixWare or the bundle of freeware programs offered by Dell Computer Corp., Consensys does give you the functionality of the powerful SVR4.2 kernel, including the newest X Window system (System 11 Release 5) and the SVR4.2 Desktop manager. You also get both the Motif and Open Look window managers, along with the company's proprietary TCP/IP administration utility and virtual-console

SUITABILITY TO TASK	
Consensys V	
	FILE MANAGER EDITOR
Networking	☒ ☒ ☐ ☐
DOS Environment	N/A
GUI Integration	☒ ☒ ☐ ☐
Administration	☒ ☒ ☐ ☐
Multitasking	☒ ☒ ☐ ☐

▶ FrameMaker



Ask your
dealer about
Frame's competitive
upgrade
offer.

FrameMaker 3.0. The highest scoring,* hardest working, and best looking document publishing package you ever saw.



▶ It's no wonder FrameMaker 3.0 is seen as *the* Document Publishing standard for thousands of users all over the world. Just look at its credentials: Awards of Excellence from *BYTE* and *Sun Observer*; Editors' Choice Awards from *MacUser* and *PC Magazine*; *Windows User* Editor's Choice Finalist; *BYTE*'s Reader's Choice; *PC Computing*'s Most Valuable Product Finalist; and *Windows*' Win 100 Award; to name a few.

▶ It even won *Software Digest*'s* top recommendation in an eight-way shoot-out of the top general publishing tools.*

▶ We're so delighted we've dressed FrameMaker 3.0 in a nifty new package. And inside you'll find the very best integrated solution for those really tough publishing jobs—the ones that word processors and DTP programs were never designed to handle.

▶ Sure, you'll find FrameMaker a cinch for whipping out memos and proposals but it's when you start constructing the bigger, tougher documents that you'll really get a feel for FrameMaker's power and ease of use.

▶ And you'll find FrameMaker completely file compatible across all major desktops: Windows, Macintosh® and UNIX.

▶ To order call Egghead at **1-800-EGGHEAD** or call **1-800-U4-FRAME Ext. 981.**

 **Frame**®



EGGHEAD SOFTWARE
North America's Software Experts.

CIRCLE 103 ON READER SERVICE CARD

Copyright © 1993 Frame Technology Corporation. All rights reserved. Frame, FrameMaker, Frame Technology and the Frame logo are registered trademarks of Frame Technology Corporation. Other brand or product names are trademarks or registered trademarks of their respective companies. *Highest Scoring in Authoring Category, Software Digest Ratings Report™ Volume 9 Number 5, 1992. BYTE Award of Excellence, 1991. BYTE Reader's Choice Award, 1993. Windows Magazine Win 100 Award, 1993. PC Magazine Editor's Choice Award, 1991. MacUser Editor's Choice Award.

utility. Prices range from \$249 for a basic single-user configuration to \$1,295 for a complete unlimited-user developer set.

CHOOSE YOUR GUI

Upon installation, you can pick either the Motif or Open Look GUI. Both of these interfaces are easy to learn. File-administration tasks are as easy as dragging and dropping; these include copying files and moving from directory to directory (or from system to system if you're on a network). To launch an application from the desktop, simply drag and drop files onto the application's icon.

Consensys has a relatively modest set of system requirements compared with other systems we reviewed: just 4MB of RAM and 100MB of hard disk space. In fact, only SCO Interactive Unix could run acceptably with less system resources. Consensys also comes with a full set of Unix utilities, including awk, grep, and vi, that have standard SVR4.2 interfaces. While not as slick as the interfaces supplied with some of the other Unix versions, the desktop environment does make these programs more user-friendly and less user-hostile.

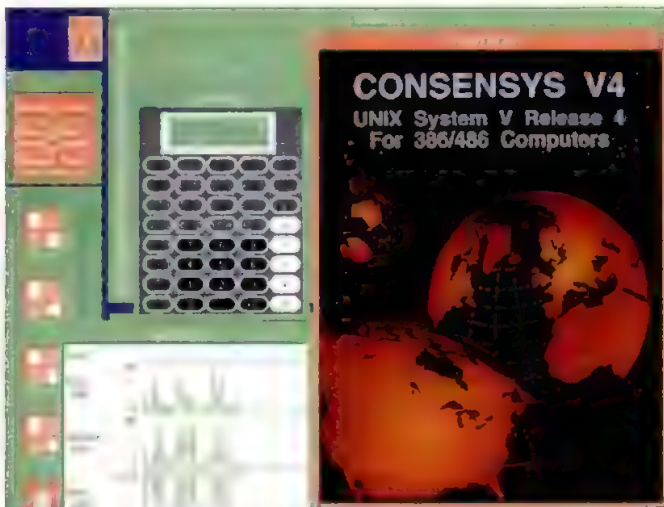
Despite the fact that it's a first-generation product for the SVR4.2 Unix family, Consensys supports a surprisingly large number of peripheral devices, including SCSI-driven ISO-9660 CD-ROM drives and High Sierra-compatible units. Network support at present is limited to the stock NFS and RFS support provided by the kernel. Thanks to the company's proprietary TCP/IP administration utility, this setup procedure—beastly in other versions of Unix—proves simple under Consensys.

ADMINISTRATION AND INSTALLATION

Consensys provides its own revamped installation and system-administration utilities.

These tools, too, have a GUI interface and are easy to use. One "gotcha" to keep an eye out for: You must install the system administration tools during the initial installation, or the module will not install properly. This problem appears to be a generic fault with the base SVR4.2 code. Another weak link we found appears to be a throwback to earlier incarnations of Unix, before the advent of the GUI: In SVR4.2 some administration tasks can be performed only by the system Owner, yet we discovered that it was possible to set up the system without designating a system Owner. Getting around this took some expertise.

Consensys installs from quarter-inch tape or from floppy disks (expect several hours of tedious disk swapping to install the entire system if you opt for the latter method). A CD-ROM version should be available by midyear. After our initial installation, our testers could access the Unix prompt but not the GUI. It took us several more hours of searching for a well-hidden explanation in the documentation to solve the problem. Once we ran the proper commands (the elusive `/usr/X/adm/dtdeluser` user, which deletes the first desktop user, and then `/usr/X/adm/dtadduser` user, which reinstates a desktop user), the Desktop Manager came up.



For its GUI, Consensys employs the newest X Window system, System 11 Release 5. Users can also choose which window manager they prefer to use: Motif or Open Look.

The SVR4.2-based convention of issuing an Owner account turns out to be one of the charms of Consensys. With Unix systems, only the root user has the ability

FACT FILE

Consensys V 4.2

Consensys Corp., 1301 Pat Booker Rd.,
Universal City, TX 78148; 800-388-1896,
416-940-2900



List price: Basic package for two users, \$249; complete package for unlimited users, \$1,295

Requires: 386SX-based PC or better (486DX or better recommended), 4MB RAM (8MB recommended), 100MB hard disk

space

In short: With the power of the SVR4.2 kernel but few frills, this product is a good implementation of standard Unix. It is affordable and less of a resource hog than other Unix versions, and it boasts an improved installation utility that makes Unix less of a hassle. But until it has DOS and Windows support, shops migrating from those operating systems should look elsewhere.

 UN READER SERVICE CARD

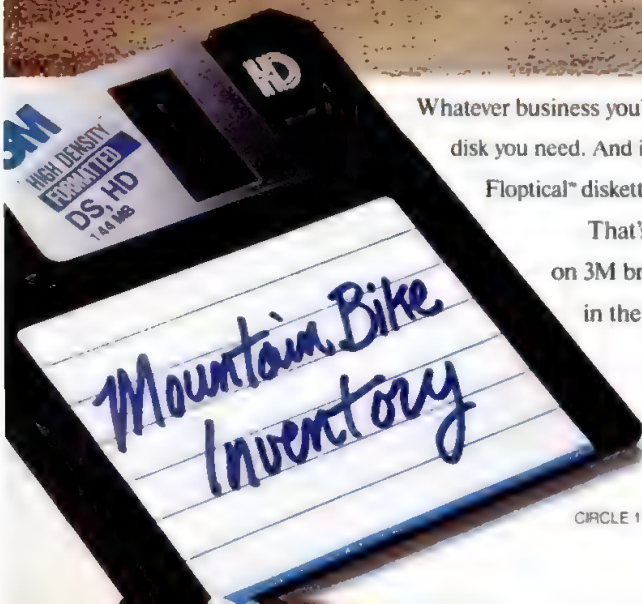
to perform such tasks as installing printers, shutting down the system, and adding or deleting users. Moreover, the user must perform these tasks from the command line, and using the root typically requires some Unix expertise. While this is an understandable security measure (after all, you don't want just any user shutting down the system), there are times when it is useful to have other people who are able to perform one or more of these tasks. With Consensys's Owner account, the owner has all the privileges and abilities of the root user—except the ability to shut down the system—and can perform these tasks through the GUI. The owner can add new users, modify the system configuration, and add, delete, or reset printers. The owner can also give other users one or more of these privileges, up to and including giving another user complete owner privileges.

APPLICATIONS PLAYING CATCH-UP

With its SVR4.2 kernel, Consensys can run any applications ported to the USL Unix release. Most major software vendors that have supported Unix currently have or will soon have ports to the SVR4.2 kernel. We also had no difficulties installing packages that were



Your business is safe with us.
Especially when it's really rolling.



Whatever business you're in, we're ready to roll in just about any size, capacity or factory formatted disk you need. And if business is really moving you can get up to 21 megabytes of storage on our new Floptical® diskettes—they're ready for your new system whenever you are.

That's why more businesses protect important information on 3M brand diskettes and data cartridges than any other brand in the world.

Call 1-800-888-1889, ext. 3, to find out more.



Floptical diskettes require compatible drives.
"Floptical" is a registered trademark of INSITE
Peripherals. © 3M 1993

3M Reliability

CIRCLE 167 ON READER SERVICE CARD

The NeXTStep Generation

by Heidi A. Patton and Steven J. Vaughan-Nichols

NeXT is known for its innovative operating system, which until recently has been available only with the company's proprietary hardware, the futuristic NeXTCube. But recently NeXT sold the hardware part of its business to Canon; now, to enjoy wider success, it has been working to make its software available on the Intel platform.

NeXT hopes to convince users that its OS is a more productive environment than the better-known alternatives: Windows NT, OS/2, and the more traditional implementations of Unix. So much of NeXTStep is based on cutting-edge object-oriented technology that it has often been compared with operating systems not even available yet: Taligent's Pink and Microsoft's Cairo project.

NeXT is determined to make the most of its NeXTStep for Intel Processors. The early beta we saw didn't yet contain the forthcoming DOS emulation, but it did show off the gorgeous user interface and the productive Interface Builder development environment.

NEXT-GENERATION OS

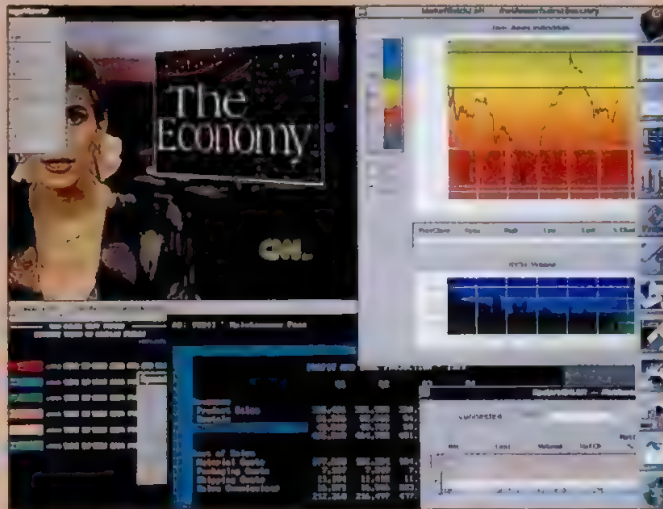
NeXT has rigorously adhered to the object-oriented paradigm in NeXTStep. The graphical environment, dubbed the Workspace Manager, is a highly designed interface where end users can easily mix

cally reflected wherever that element appears. Multitasking, networking, and multimedia are securely integrated. While multiple operations still leave Windows 3.1 floundering, NeXTStep (thanks to its enhanced Mach operating

kernel) never skips a stitch while running half a dozen operations at once. The multimedia support provides video-in-a-window capabilities and full audio support.

NeXTStep's real-time graphics amaze and delight. It is the only Unix we looked at that integrates 24-bit graphics support. The system takes advantage of the linear frame-buffer facilities available in many high-end graphics cards and employs a technique called "windows backing store," which keeps window images in either memory or virtual memory. As long as you've got RAM to spare, NeXTStep gives

you eye-popping true-color visual images that move with incredible fluidity on-screen. The technique also enables fancy visual effects like image transparency, in which images can be seen through other images. NeXTStep also includes cross-application support for



NeXTStep for Intel Processors has a user interface that's nothing short of breathtaking. With 24-bit graphics support, NeXTStep offers true-color images that move with incredible fluidity on-screen.

menus, icons, and windows into a customized interface—no third-party development tools required. File manipulation and program launching is all done by drag and drop, and NeXTStep supports Object Links, where changes made in one document element are automati-

produced for other Unix platforms. Grammatik for SCO Xenix, for example, ran quite well under Consensus, although both Lotus 1-2-3 and WordPerfect had to be started from the Unix command line in a terminal window rather than directly through the GUI.

Once started, Lotus 1-2-3 worked beautifully, offering reasonable performance. WordPerfect was not as successful, however. Text would not draw well on-screen, and the entire window constantly flickered when we entered information. The company suspects a compatibility problem with our VGA driver.

Consensus's help facilities are more than adequate. Users can access an online manual from any terminal window or obtain help from almost anywhere on the desktop.

With the DOS compatibility promised by the impending upgrade and stream of SVR4.2-compatible applications, Consensus is a product you should consider. It has modest system requirements but still offers enough features to get you up and running effectively. Consensus offers the chance to create an affordable system with just the functionality you need today, and the possibility for future enhancements.

Dell Computer Corp.

Dell Unix System V Release 4

BY STEVEN J. VAUGHAN-NICHOLS

It's strange for PC users to think of Dell Computer Corp. as being in the operating system business. But in fact, Dell has a very complete version of Unix. Dell Unix System V Release 4 comes with just about every useful Unix and freeware tool, an esoteric collection that includes the elm mail interface, the perl data-manipulation language, the EMACS text

the Pantone color-matching system.

These visual delights come at a cost. NeXTStep requires a minimum of 16MB of RAM for color graphics (24MB are recommended). Moreover, NeXTStep uses 486-specific instructions and runs only on 486- or Pentium-powered machines. All that, plus the required 120MB of hard disk space for the user environment alone, adds up to an operating system that demands haute cuisine hardware.

Communications will also prove to be a strong point for NeXTStep. The Mach kernel supports object messaging, which simplifies not only interprocess communications but also intersystem communications. NeXTStep has always supported Unix's networking standards, like NFS and TCP/IP. Release 3.0, which is NeXTStep's foundation, comes with NetWare client and Macintosh Apple Share client software.

OOP DEVELOPMENT TOOLS INCLUDED

NeXT is also bringing NeXTStep's well-respected development environment to the PC world. The Project Builder component is an integrated point-and-click application for managing and maintaining development projects. The Interface Builder helps developers create user interfaces that are consistent with the look and feel of all other NeXTStep applications. For commonly used programming objects (like panels for selecting files and objects that handle data exchange and print-

ing), NeXTStep includes the Application Kit. Programmers can plug these ready-made elements into their applications or tailor them for more specific functionality. There's even an object-oriented database development tool, the Database Kit, that lets programmers build GUI front-end database apps quickly.

GOOD APPLICATION SUPPORT

Several popular programs, like WordPerfect, Adobe Illustrator, Lotus Improv, and Informix's Wingz, already exist in NeXTStep versions. The operating system itself comes with a variety of cutting-edge applications, such as a multimedia e-mail system that lets you send and receive sound and graphics elements as well as text.

We'll need to wait to see how NeXTStep handles DOS and Windows applications, though. NeXT's integration of Insignia Software's SoftPC DOS emulator was unavailable for testing during the beta cycle. SoftPC allows you to run DOS 5.0- and Windows 3.1-compatible programs in standard mode.

NeXTStep for PCs is as beautiful and awe-inspiring to look at as its picture on the on the company's sleek black boxes. Its easy-to-use object-oriented interface makes it stand apart from the other 32-bit operating systems. The steep hardware requirements may not make it the Volkswagen of operating systems, but there's always a market for a Mercedes. □

editor, the TeX typesetting language, and the Gnu C compiler

As you might expect, Dell will sell you hardware as well—in the form of a 486DX PC with the operating system already loaded. If you consider the quality of Dell's systems, this is a very tempting bundle indeed. And although Dell Unix will run perfectly well on non-Dell hardware, finding out exactly what motherboards and peripherals Dell Unix supports proved to be more trouble than it was with other vendors. Once armed with this information, though, you won't have much trouble getting the system to run on non-Dell hardware.

INVESTED IN SVR4

Dell Unix is based on USL's SVR4 kernel, and Dell does not plan to move to the newer version, SVR4.2. The company has opted to stay with SVR4 because it has devoted considerable time and resources toward improving the SVR4 kernel. In fact, Dell Unix ran more smoothly than the other reviewed Unix versions, and offers numerous enhancements over the stock SVR4. For example, Dell's device drivers have been designed to work with the operating system kernel so the system administrator can easily obtain I/O address, shared memory, and interrupt information for every device on the

system. Adding devices is also easier because all of Dell's device drivers automatically configure themselves: The OS will seek and find the appropriate unused address range and interrupts for a supported device. And programmers will be delighted that Dell Unix comes with the complete Unix development system for a lower list price than other vendors charge for their basic systems.

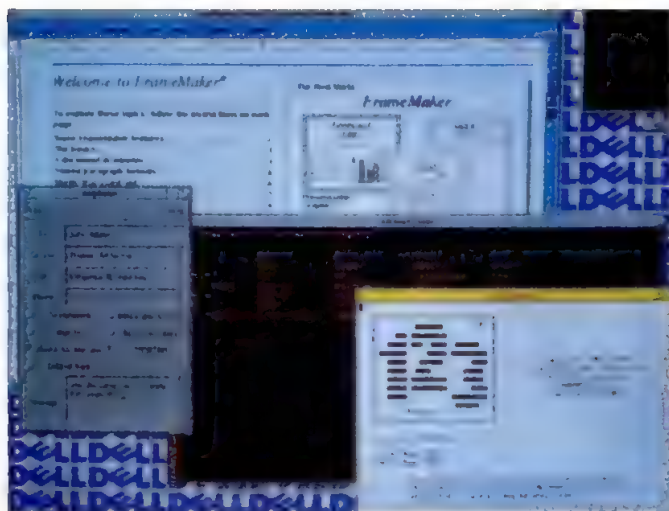
Installing the operating system, from a QIC-24-compatible tape, is simple. While it takes longer than CD-ROM installations, it's not the boring torture that installing from floppy disks can be. But be certain that you have the right equipment: Dell Unix will not work with a 60MB drive. You need one compatible with 150MB, 250MB, or 525MB tapes. The system is also available on DAT.

LONG ON PERFORMANCE, SHORT ON HELP

The applications we tested ran better on Dell Unix (even though we tested it on non-Dell hardware) than on the other systems. Dell bundles a DOS emulator, Locus Computing Corp.'s Merge, to provide DOS 5.0 support. You can run Microsoft Windows 3.0 in Real mode, but Microsoft Windows 3.1 support is not included. We found that when we used expanded memory, Merge showed an alarming tendency to slow system performance. Also, its DOS networking is not as strong as UnixWare's, since you won't find Microsoft LAN Manager or NetWare support.

TCP/IP networking, on the other hand, is well supported, and TCP/IP ran more smoothly on Dell Unix than on the other systems. While the included graphical interface didn't make TCP/IP as easy to set up as it is in SCO Open Desktop or UnixWare, it ran more solidly, resist-

SUITABILITY TO TASK				
Dell Unix System V				
	Easy	Good	Excellent	Very Good
Networking	●	●	○	○
DOS Environment	●	●	○	○
GUI Integration	●	●	●	○
Administration	●	●	○	○
Multitasking	●	●	●	●



Based on Motif and X Window System 11 Release 5, Dell Unix System V Release 4's graphical interface will seem encouragingly familiar to users of Microsoft Windows.

ing temporary network disconnections and the like during our testing. The operating system's Serial Line Internet Protocol (SLIP), which lets you run TCP/IP over asynchronous connections, dealt with noisy phone lines that caused other SLIP connections to falter. Dell's SLIP can also be configured and stopped without a reboot—something you can't do with some other Unix systems.

It's fortunate that Dell Unix runs so smoothly, since the documentation offers scanty help. These tiny manuals give you just enough information to get your Unix up and running smoothly. If you want more (and you probably will), Dell will sell you the Prentice-Hall System V manuals. But that does you little good when you're stuck with a misbehaving system, since these manuals are not Dell-specific.

Dell does offer a variety of help options. You can obtain OS updates directly from Dell-run Internet sites via TCP/IP (dell1.dell.com and dell2.dell.com). Dell also has a large support staff, and our experiences with technical support were uniformly positive.

TO GUI OR NOT TO GUI

Unlike the other system vendors, Dell doesn't buy into the idea that a GUI will be your first choice for an interface. Once the system is up and running, you can choose to run Dell Unix in either character or GUI mode. Users who can't live without the Unix command line will be

happy to find that Dell supplies the Korn shell along with the more common Bourne and C shells.

Once you've started using Dell's GUI, though, you will wonder why the company did not have the GUI start up automatically on boot-up. Based on X Window System 11 Release 5, the Motif window manager, and Version 2.0 of IXI's X.desktop, the object-oriented GUI

works smoothly and in ways that Windows users will find encouragingly familiar. While we prefer Visix's Looking Glass desktop manager for its customizability, X.desktop gives you excellent functionality with an icon-based interface that features drag-and-drop functionality for managing files and launching programs.

Contrasted with SCO Open Desktop

FACT FILE

Dell Unix System V Release 4

Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78759-7299; 800-289-3355, 512-338-4400; fax, 512-338-8700



List price: Basic package for two users, \$495, complete package for unlimited users, \$1,295
Requires: 386-based PC or better (486 or better recommended), 4MB RAM (8MB recommended), 150MB hard disk space.

In short: This Unix product is the best of its kind. It handles multiple tasks without a hitch, and its GUI protects users from the often-confusing Unix command line. The excellent peripheral support and generous bundle of free Unix apps will continue to make it a favorite among dedicated Unix fans, but with only TCP/IP network support and average DOS support, it may not be the best choice for users looking to make the transition from DOS

472 ON READER SERVICE CARD

(which is based on the same windowing system, window manager, and desktop manager), Dell's interface doesn't connect as well with the underlying operating system as it might. It is, for example, easier to access the mail program from SCO Open Desktop than it is from the X.desktop interface that Dell utilizes. That said, Dell's GUI was perfectly functional.

For a Unix purist, there's much to love about this operating system, not the least being its amazingly complete collection of Unix freeware and surprisingly bug-free operation. Still, it is still hard to see Dell Unix moving out of its current market, with its SVR4 commitment and its limited DOS compatibility. Dell Unix is for users who already have a commitment to Unix, not users who want to operate optimally in Unix and DOS.

SunSoft Inc.

Interactive Unix

BY STEVEN J. VAUGHAN-NICHOLS

The oldest Unix version in this roundup is also one of the most solid. SunSoft's Interactive Unix, Version 3.0.1, has improved with age. And despite SunSoft's porting of Solaris to the x86 platform—a procedure that's still in progress and talked about frequently—Interactive hasn't been laid to rest; a new release is in the works. (For more information on Solaris, see the sidebar "Solaris 2.1: The Rise of a New Sun?")

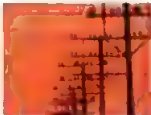
While SunSoft is readying Solaris to accommodate after large corporations that need a distributed computing environment designed for client/server, mission-critical applications, Interactive remains a solution for small businesses that need a multiuser, multitasking operating system.

Interactive is well-suited for the task. The only drawback is that Interactive's kernel—SVR3.2—is not as compatible with applications written for different flavors of Unix as are the newer SVR4 and SVR4.2 versions of Unix.

You can purchase either a two-user version (\$495) or a network version (\$895) of the basic operating system. Most users, however, will want to opt for

GET THE POWER

COPYING POWER.

PRINTING  **POWER.**

SCANNING POWER. GET

THE  **POWER TO PUT ON**

PAPER WHAT YOU CREATE ON

THE SCREEN.



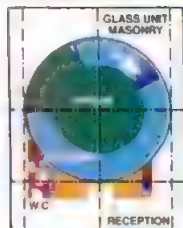
THE POWER TO **SCAN IN**

24-BIT COLOR.

THE POWER TO **PRINT IN 24-BIT**

COLOR. AT 400 DPI. FOUR COLOR PROCESS WITH 256

GRADATIONS PER COLOR. IN WINDOWS™ AND MACINTOSH®.



GET THE POWER TO CREATE HIGH-QUALITY COLOR DOCUMENTS TO

GET YOU THE PROMOTION. THE POWER TO WIN THE NEW PIECE

OF BUSINESS. THIS IS THE FUNDAMENTAL IDEA BEHIND THE CANON

CJ10 WITH OPTIONAL CONNECTIVITY. TO GIVE YOU HIGH-QUALITY

COLOR COPIES. TO GIVE

AFFORDABLE ENOUGH

GET THE POWER. CALL



YOU THE POWER OF COLOR.

FOR ANY SIZE BUSINESS.

1-800-OK-CANON.



**COME SEE US AT
COMDEX BOOTH #1630**



**Come see the Canon Greater
Hartford Open Golf
Tournament June 24-27, or
watch it on CBS (June 26-27.)**

© 1992 Canon U.S.A., Inc.

Canon is a registered trademark of Canon Inc.
Bubble Jet™, CJ10 logo, and color mark are trademarks of Canon Inc.
Macintosh® is a registered trademark of Apple Computer, Inc.
Windows™ is a trademark of Microsoft Corporation.

THE POWER OF COLOR IS YOURS.

CIRCLE 187 ON READER SERVICE CARD

Canon

“No other program lets you create presentations so quickly and effortlessly, and none pays so much attention to guiding you through the process.”
PC Computing 12/92 MVP Award

“Remarkably easy to use...”
Windows Magazine 2/93

“Freelance Graphics for Windows is a joy to use and does an excellent job in all stages of developing a presentation...”
Window Sources 5/93

The first rule of any presentation is keep it simple.

And it doesn't get any simpler than this.

Introducing Freelance Graphics for Windows, Release 2.0.

The first release of Freelance Graphics® won every major award in the presentation graphics category.

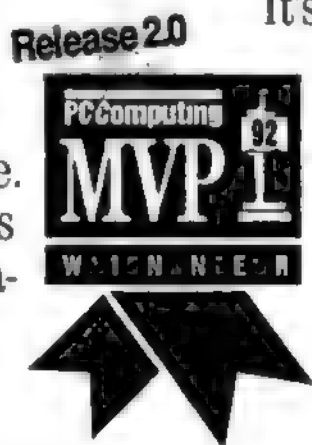
Now Lotus® enhances Release 2.0 with new features and improved usability that actually make the simple three-step process even simpler. In fact, it's now so fast, so friendly and so automatic, it's actually changing the way people use presentation graphics software.

Now people not only use Freelance Graphics to easily create beautiful last minute presentations, they use it to quickly generate handouts, even for informal meetings.

Let our SmartMasters be your guide.

Only Freelance Graphics has SmartMasters™ to automatically guide you through every step of the design process. You simply select the look you want, choose a page layout, and start filling in the blanks. It's that easy.

Just one click brings you a complete array of drawing, charting and editing tools, plus on-screen galleries for chart types, symbols, tables, and org. charts. You'll easily create professional quality output in overhead, slide, handout, and screen show formats. And a new toggle switch allows you to instantly view your presentation



"Creating a presentation of even (100 slides) is absurdly easy--and much easier, in many ways, than with competing products..."

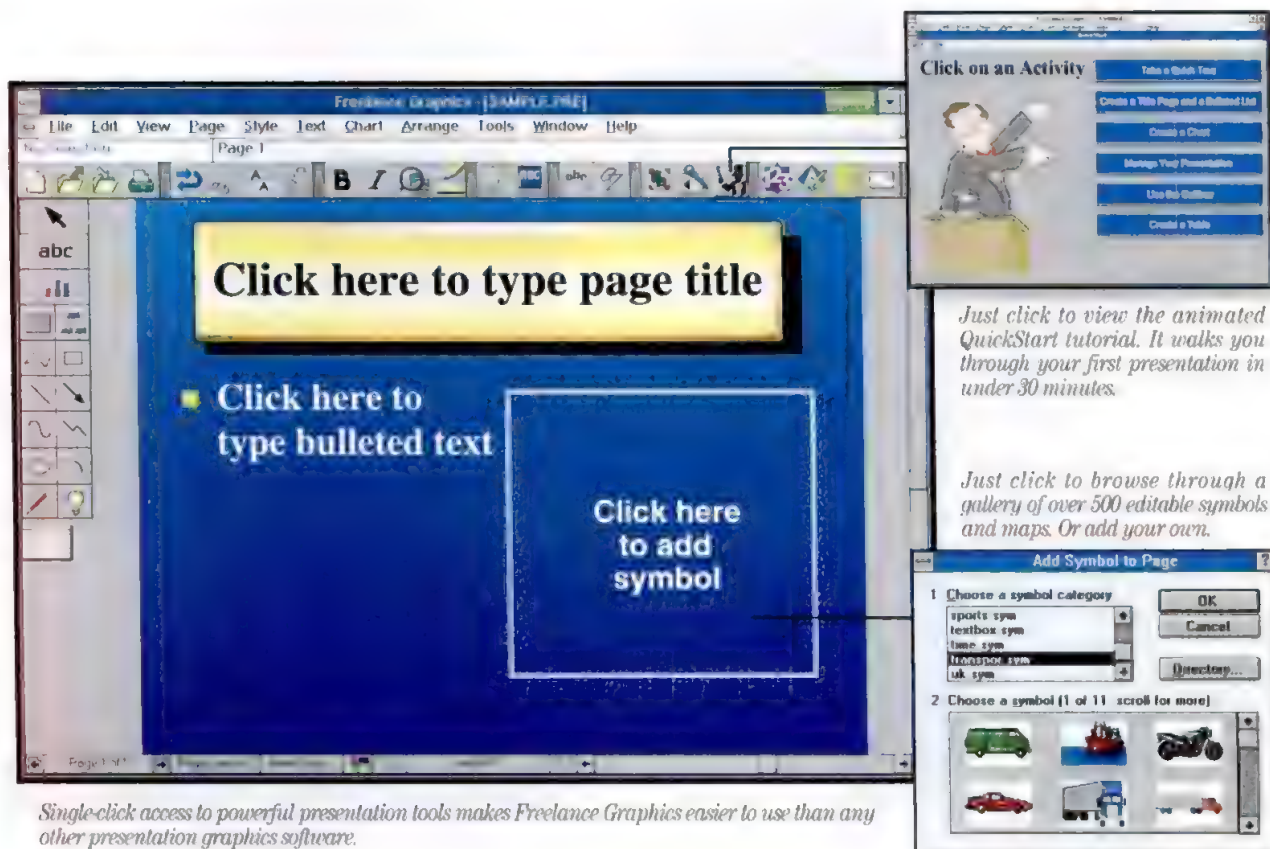
PC Week 2/15/93

"Inviting and even fun to use. More important, I produced a presentation in about an hour."

BYTE 2/93

"There's bad news for the competition... Freelance Graphics for Windows 2.0 is even better than its predecessor. This program is about as straightforward and easy to use as they come."

PC World 1/93



Single-click access to powerful presentation tools makes Freelance Graphics easier to use than any other presentation graphics software.

in black and white or color. Freelance automatically optimizes the design for printing either.

You'll be amazed at the beautiful results you immediately generate, without really trying. In fact, you couldn't look bad even if you tried.

Is the world's easiest presentation graphics software easy enough for you?

Call 1-800-872-3387, ext. 8869* to order

Getting Started.



your free, full-featured working model. You'll see just how simple it can be. While you've got us, ask about our special competitive upgrade price.

And for those just getting into Windows,[™] keep in mind that Freelance Graphics is also included in Lotus[®] SmartSuite.[™] four award-winning Lotus Windows applications at a very attractive price.

Lotus Freelance Graphics 2.0
Presentation Graphics for Windows

■ Solaris 2.1: *The Rise of a New Sun?*

by Noel-Marie Taylor and
Mark Wallace

"All the wood behind one arrowhead" has been the philosophy of Sun Microsystems as it pushed its SPARC platform and its accompanying Solaris operating system. Now SunSoft, Sun's software subsidiary, is aiming at a new bull's-eye: your desktop. As we went to press, SunSoft had just begun delivering Solaris 2.1 for x86—a Unix-based operating system that targets a wider audience than Sun's traditional high-end niche. With the official release long in the making and not yet ready in time for this review, we took a good, hard look at the beta version.

Solaris, in its earlier incarnation as SunOS, has been around since 1982 for RISC-based computers. With the roll-out of Solaris for x86, Sun is touting its "distributed computing environment" concept. The company hopes to convince Fortune 1000 firms that Solaris is the right platform for their entire businesses. The focus is on integrated, mis-

sion-critical, enterprise-wide computing: hundreds (if not thousands) of machines, from PCs to SPARC-powered mainframes, all running Solaris and sharing data and information.

CATERING TO END USERS

Born from the Berkeley 4.1 version of Unix, Solaris is an operating environment designed for end users. It has a terrific collection of deskset tools that work well together. The mail tool, easily the niftiest of the set, has built-in hooks for multimedia mail, including support for voice mail and the creation of hooks for just about any kind of media you would want to ship across the network. Simply drag and drop text or any other object from one window to another.

This power is provided by an underlying package known as ToolTalk, which transparently manages the transfer of information between different application environments. Similar to the NeXTStep messaging system (see the sidebar "The NeXTStep Generation"

for more information), ToolTalk handles the negotiations about format and meaning and takes care of the communications. The operating system ships with a variety of tools such as a paint program, screen-capture program, and text editor that make use of ToolTalk.

The GUI environment that greeted us after we loaded the Solaris beta was Sun's proprietary Open Look desktop. While other Unix vendors have opted for the rival Motif manager for their Intel chip-based systems (and some vendors even offer a choice), Sun stayed with its Open Look for Solaris, mainly to ensure a common look and feel across the Intel and SPARC platforms. But with the recent COSE agreement for a unified Unix (discussed in more detail in the introduction), Sun has made a major concession for the greater good and agreed to adopt the Motif environment.

FUTURE OS TODAY

Clearly, Solaris for x86 will integrate neatly into Sun's strategic information-

SunSoft's more complete configurations: Application Platform (\$985), Network Platform (\$1,315), Workstation Platform (\$1,535), and Workstation Developer Platform (\$2,635). The first of these is designed for users who will be running bread-and-butter character-based DOS and Unix applications. The network package includes complete TCP/IP and NFS software. The workstation edition adds an excellent GUI system called Easy Windows. Finally, programmers will want to get their hands on the Workstation Developer

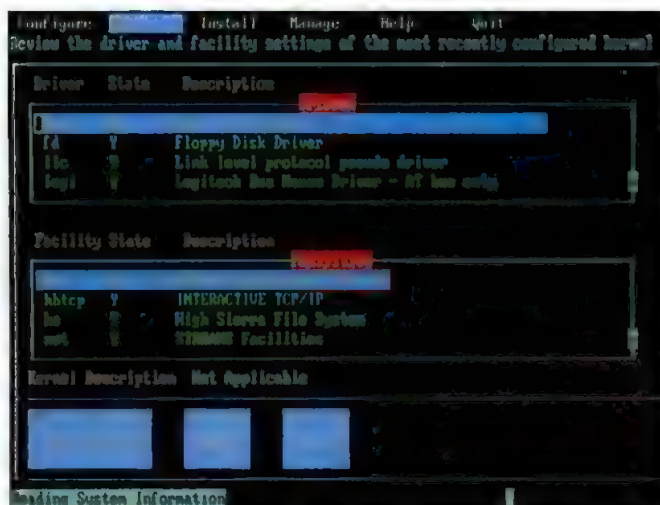
Platform, which we used for our tests. This included the TCP/IP and NFS networking protocols, the VP/ix DOS emulator, the TEN/PLUS user environ-

ment, the software development system, and X Window.

EASY INSTALL AND ROCK-SOLID

Installing a Unix system is not an easy job, but SunSoft has made it as painless as possible for a disk-based system. Though we would prefer to see CD-ROM installation available, even with 3.5-inch floppy disks it took us only an hour to install the entire operating system. You could spend full days installing other versions of Unix. But if you have an unusual setup—say, an IDE hard disk and a SCSI unit—be prepared to get cozy with the manuals. The information you need will probably be in there, but only a Unix systems administrator could love these manuals.

Also, to reap the full benefit of any extra system RAM you might add, you must reconfigure and rebuild the kernel; the other reviewed Unix systems handle reconfiguration more transparently.



Interactive Unix's Easy Windows GUI system, based on Visix Software's Looking Glass, is superb. For the system administrator, selecting configuration options is as easy as point and click.

management environment. The Network File System (NFS) and Network Information Service (NIS) were invented by Sun and are integrated seamlessly into Solaris. NFS lets users share file systems across the network without the need for dedicated file servers. NIS provides centralized administration services for handling user and network data files across a multinode server/workstation environment.

Sun's future strategy, which emphasizes Distributed Objects Everywhere (DOE) and Open Network Computing (ONC), is woven throughout Solaris. DOE and ONC combine to enable both data files and programs to be used and run in a distributed fashion over a network, regardless of the underlying architecture.

Another compelling advantage that Solaris offers is an integrated common operating environment over multiple architectures. More than 4,000 SPARC programs will be available for the x86



Solaris for x86's GUI offers superb graphics to complement the system's multimedia support. SunSoft has agreed to adopt the Motif desktop manager for future releases to help standardize the Unix platform.

platform. Moreover, DOS 5.0 support and Microsoft Windows 3.1 compatibility are promised soon. SunSoft's Windows Application Binary Interface (WABI), developed with Praxsys Technologies, will let users run Windows applications without Windows. Also in the works for a future x86 version is the native support for multiprocessing and dis-

tributed computing now found on Solaris for the SPARC platform. Installation, from a CD-ROM and a boot floppy disk, is remarkably simple. The documentation wasn't up to Sun's usual standard, but this should be remedied by the official product release. The extensive on-line documentation system is based on a CD-based Sun product. Sun has consistently articulated and supported a vision of the future that only fools would dare to sneer at. Though we had only a beta version of the software, it clearly showed that Sun has succeeded in achieving its goal of a common look and feel between SPARC and Intel platforms. Veteran Solaris users will have to remind themselves that they're sitting at a 486 machine, not at a cleverly disguised SPARCstation. Those in search of a distributed information management system capable of supporting symmetrical processing should have a look. □

Any Unix administrator will appreciate Interactive's one-stop approach to system administration: the character-based sysadm utility. Almost every commonly used system administration task can be accomplished from sysadm; with its clean, complete design, the utility stands out.

Interactive's Unix foundation is SunSoft's port of AT&T's SVR3.2. Although far from the state of the art in Unix research, the operating system has been thoroughly tested and debugged. If you're tired of bleeding all over technology's cutting edge, you will find Interactive's stability a pleasant change of pace. SunSoft hasn't stuck completely to System V Release 3.2 of Unix. Interactive also included some enhancements present in BSD Unix. The most noteworthy of these is sendmail. This mail handler lets you more easily set up multiple-network node connections. Other BSD improvements will be available in Ver-

sion 4.0 of Interactive. This upgrade will let you time events to within milliseconds instead of seconds, assign file names up to 255 characters in length, and create file names with "aliases," which are symbolic links to other files. These enhancements will let SVR3.2 Unix work with the newer SVR4 and BSD file systems.

STICK TO THE BASICS

Interactive's networking facilities are standard TCP/IP and NFS; you'll find no surprises here. The basic system comes with only standard Unix security; a C2-level module is available separately for \$655.

The VP/ix DOS emulator runs well, within limits. While VP/ix can emulate LIM EMS 4.0, it can't supply you with

extended memory. Ordinary DOS character-based programs will run smoothly, but you can forget about anything more elaborate, such as Microsoft Windows 3.1. (Windows 3.0 is supported in Real mode only.) SVR3.2 is a Unix first and doesn't play as nicely with the DOS world

as do the other operating systems.

On the other hand, since Interactive is compatible with SCO Xenix applications, you may not miss DOS. For office work under Unix, SunSoft supplies TEN/PLUS, which combines an

easy-to-use file manager with a word processor and an optional e-mail interface. While not the equal of top-flight apps that do the same things, it is easy to use and functional enough for most.

SUITABILITY TO TASK

Interactive Unix

	POOR	FAIR	GOOD	EXCELLENT
Networking	●	●	○	○
DOS Environment	●	○	○	○
GUI Integration	●	●	●	●
Administration	●	●	●	●
Multitasking	●	●	●	○

Custom Compacts

1990, 1991 and 1992 World Class Awards
for Best Mail-Order Company



All software is not copy-protected, unless indicated otherwise by (CP).

The four- or five-digit number next to each product is the product's ITEM NUMBER. Please refer to this number when ordering. Thank you.

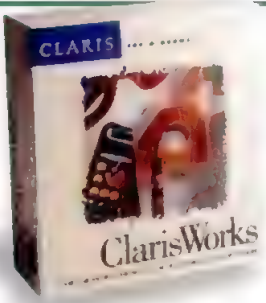
We carry only the latest versions of products. Version numbers are current at press time. Products listed here in red are Microsoft Windows Applications.

COMPUTERS

Compaq Computer ... 3 years	
11588	ProLinea 4/33 with 240 MB, Windows, Local Bus while supplies last \$1759.
10893	ProLinea 4/50 with 240 MB, Windows..... while supplies last 1689.
11590	LTE Lite25E with 120 MB, Windows 2999.
9552	Centura 3/25 with 120 MB, Windows 1599.
11453	Deskpro 4/25is with 120 MB, Windows..... 1499.

BUSINESS APPLICATIONS

Approach Software	
3830	Approach 2.0 for Windows Competitive Upgrade 95
Automap	
2729	Automap USA for DOS.. 55. 8569 Windows.. 55
Banner Blue Software	
2088	Org Plus 2.0 for Windows 125.
Borland International	
10616	Quattro Pro Win (3 1/2" only) .. while supplies last 95
10710	Paradox Windows (3 1/2" only) while supplies last 129
11445	Paradox/Quattro Pro for Windows Bundle 189
Coore	
8933	OmniPage Pro 2.1 629
Clariss Corporation	
10996	ClarisWorks Win. 95. 5257 FileMaker Pro Win. 119
5228	FileMaker Pro for Windows Competitive Upgrade.. 89
Concentric Data Systems	
6575	R&R Report Writer DOS 159. 9236 Windows. 159
Contact Software	
7435	ACT! for Windows 239
Intuit	
2426	Quicken 5.0..... 45. 5596 for Windows 45
Lotus	
5653	1-2-3 2.4 (5652 3 1/2")..... 335.
5417	1-2-3 3.4 (5416 3 1/2")..... 399.
2755	1-2-3 4.0 for Windows (2756 3 1/2") 309



**NEW
INTRO
PRICE,
ONLY
\$95!**



**PROMO
PRICE,
ONLY
\$119!**

Clariss Corporation
 10996 *ClarissWorks for Windows*—The new choice for Windows integrated software, has full-featured word processing, database, spreadsheet, charting, & graphics capabilities seamlessly integrated to work together. **\$95.**

5257 *FileMaker Pro for Windows*—Winner of PC Magazine's Editors' Choice Award. This database offers easy access to powerful and sophisticated features without complicated programming commands **\$119.**
 5228 *FileMaker Pro Competitive Upgrade* .. **89.**

3424	1-2-3 4.0 for Windows Upgrade (3428 3 1/2")... 99
5799	Ami Pro 3.0 239
1847	Ami Pro 3.0 Competitive Upgrade 99
10753	Improv for Windows (3 1/2" only)..... intro. price 99
1493	Organizer for Windows..... 99
5981	SmartSuite (5982 3 1/2")..... 469
MECA	
2798	Managing Your Money 9.0 32.
Microsoft	
2735	Works 2.0 for Windows 129
6195	Word 2.0 for Windows (7811 3 1/2")..... 299
3881	Word for Windows 2.0C Comp Upgrd (7841 3 1/2") 125
2856	Excel 4.0 for Windows (5680 3 1/2")..... 299
5693	Excel 4.0 Competitive Upgrade (5695 3 1/2")... 125
8355	Access 1.0 for Windows (8326 3 1/2")..... call
10056	FoxPro 2.5 for Windows (10057 3 1/2")..... 299
7388	Project 3.0 for Windows (11367 3 1/2")..... 445
8137	Office 3.0 for Windows (8138 3 1/2")..... 449
Nolo Press	
2962	WillMaker 4.0 35.
Peachtree	
5757	Accounting 5.0 for Windows 79
Polaris Software	
4395	PackRat 5.0 249
Reality Technologies	
6572	WealthBuilder 3.0 (incl. Smart Investor) (3 1/2" only) 94.
TIMESLIPS	
5698	Timeslips Release 5.1 189.
WordPerfect Corporation	
4396	Grammatix 5..... 55. 7483 for Windows 55
7582	Presentations 2.0 279.
3804	WordPerfect (3795 3 1/2")..... 279.
3494	WordPerfect 5.2 for Windows (3497 3 1/2")..... 279
4786	WordPerfect for Windows Ver Upgrd (4795 3 1/2") 79

GRAPHICS & DESIGN

Adobe Systems	
10774	Adobe Photoshop 2.5 for Windows (3 1/2" only) 548
6591	Adobe Illustrator 4.0 for Windows (6439 3 1/2") 389
7940	Adobe Type Set Value Pack (7941 3 1/2")..... 39 (Entire Adobe Type Library available)
AGFA	
10396	Discovery TrueType Pack 49.
Aldus	
11033	FreeHand Windows Comp. Upgrd. (11034 3 1/2") 145
11036	PhotoStyler Win. Comp. Upgrd. (11037 3 1/2").. 189
11667	PageMaker 5.0 for Windows (3 1/2" only) (June) 579
Altsys Corporation	
8675	Fontographer for Windows 3.5 (3 1/2" only)..... 259
Application Techniques	
1214	Pizazz Plus 3.0 79.
Area Software	
6030	FontMonger 1.0.7 for Windows 89
Bitstream	
8040	FaceLift 2.0 for WordPerfect 5.0/5.1 (3 1/2" only).. 69.
2089	MakeUp 1.1 for Windows 79
Corel Systems	
5506	CorelDRAW! 3.0 (5508 3 1/2")..... 395
DeltaPoint	
5172	FreezeFrame 1.0 for Windows 62
Fractal Design	
7822	Sketcher 1.0 for Windows 94
Inset Systems	
7298	Hijaak 2.1.. 115. 3820 1.0 for Windows ... 115
LaserTools	
9510	PrimeType 2.0 for WordPerfect..... 62.

Lotus	
3523	Freelance Graphics 2.0 for Windows (5005 3 1/2") 349.
Micrografix	
3627	Windows Draw! 3.0 (3628 3 1/2")..... 99.
MicroLogic Software	
5350	TrueType 1.0 for DOS 49. 8579 MoreFonts 3.0 75.
Microsoft	
10051	Font Pack 2 for Windows 45
3337	Publisher 1.0 for Windows 129
7387	PowerPoint 3.0 for Windows (8423 3 1/2")..... 299.
Shapeware	
5426	Visio 1.0 for Windows (3 1/2" only)..... 199.
Software Publishing	
4403	Harvard Graphics for Windows (4402 3 1/2")..... 369.

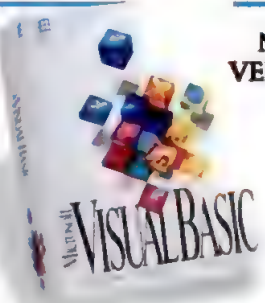
SYSTEM UTILITIES & PROGRAMMING

AddStar	
8807	SuperStar Pro 1.0 85.
Avery Dennison	
6006	Label Pro 1.6 (Laser) 49.
Baler Software Corporation	
11312	Baler 6.0..... 279. 11314 Baler Express 95.
Berkeley Systems	
9885	After Dark 2.0 for Windows 29
6649	Star Trek. The Screen Saver (3 1/2" only)..... 34
Central Point Software	
9751	Anti-Virus 1.4 (9555 3.5") or 8114 Backup 7.1 ea. 89.
5039	PC Tools 8.0 (1475 3 1/2")..... 125.
11394	PC Tools for Windows (11395 3 1/2") 125
Fifth Generation Systems	
7725	Direct Access 5.1.6 64.
3950	Fastback Plus..... 95. 6431 for Windows ... 95.
Gibson Research	
9832	SpinRite 3.1 85.
Hewlett-Packard	
8731	Dashboard 1.0 for Windows 45



**NEW
WINDOWS
VERSION**

Central Point Software
 11394 *PC Tools for Windows*—The long awaited PC Tools for Windows incl.: a new Desktop, File Manager, Desktop Accessories, Backup, Anti-Virus, Data & Disk Recovery, & an Event Scheduler (11395 3 1/2").. **\$125.**



**NEW
VERSION**

Microsoft
 1624 *Visual Basic 3.0 for Windows Standard Ed.*—Fast object oriented programming language & access to data make this the most productive way to go from idea to application..... **\$129.**
 5601 *Visual Basic 3.0 Professional Edition* ... **299.**

ship overnight?

LaserTools		
6882	PrintCache 3.1	\$49.
Microsoft		
11324	MS-DOS 6 Upgrd. (11325 3 1/4") while supplies last	39.
7010	Windows 3.1 (7009 3 1/4")	89.
1624	Visual Basic 3.0 Windows Std. Ed. (10154 3 1/4")	129.
5601	Visual Basic 3.0 Windows Pro. Ed. (10437 3 1/4")	299.
11444	Visual C++ Standard Edition (3 1/4" only)	129.
PC-Kwik		
8565	WinMaster 1.5 (8566 3 1/4")	65.
4925	PC-Kwik Power Pak 3.0 w/Power Disk (8004 3 1/4")	79.
Personics		
9288	Laptop UltraVision 2.1 (3 1/4" only)	59.
Qualitas		
7539	386MAX 6.02	59.
Quarterdeck		
3221	Expanded Memory Manager 386 6.0 (3217 3 1/4")	59.
4586	DESQview 386 2.4 (4585 3 1/4")	129.
Slac Electronics		
1409	Stacker 3.1	95.
Symantec		
6397	The Norton Backup 2.2 for DOS (2356 3 1/4")	99.
2359	The Norton Desktop 2.2 for Windows (2360 3 1/4")	115.
3146	The Norton Utilities 7.0 (5136 3 1/4")	115.
8378	Norton pcANYWHERE 4.5 (8535 3 1/4")	119.
11304	pcANYWHERE 1.0 for Windows (11303 3 1/4")	129.
Touchstone Software		
11665	Check It Pro Set 1.0	79.
XTree		
8328	XTree 1.5 for Windows (8957 3 1/4")	85.
6161	XTree Gold 2.5	95.

NETWORKING/COMMUNICATIONS

3 Com ... lifetime (conditional)		
3453	EtherLink II/16	159. 3469 II/16 TP 169.
Artisoft		
2455	Lantastic AE-2 EtherNet Starter Kit 4.1	469.
2452	AE-2 EtherNet Adapter Card	199.
Caere		
4130	FaxMaster 1.0	95.
Cardinal ... lifetime		
8690	MVP24i Modem Value Pack	39.
7667	MVP96iF FaxModem Value Pack	195.
CompuServe		
10957	Windows Membership Kit 1.0	27.
Data Storm		
4798	PROCOMM PLUS 2.01 69. 6918 for Windows 99.	
DCA/Crosstalk		
5611	Crosstalk 2.0 for Windows	119.
Delrina Technology		
5974	DOSFax PRO 49. 2446 WinFax PRO 3.0 79.	
10454	Windows Communications PAK	145.
Hayes ... 2 years		
9039	Accura 2400 (ext.) 69. 9033 (internal) 59.	
7391	ULTRA 96 Modem 599. 5024 ULTRA 144 669.	
1345	OPTIMA 24 Modem 115. 3522 OPTIMA 96 349.	
8187	OPTIMA 24+ FAX96	119.
7395	OPTIMA 144+ FAX144	389.



DeltaPoint

5112 The "Must Have" graphics utility—The "Must Have" graphics utility. Convert files, view and print, and screen capture. Also includes an icon editor/creator, 300 hi-res clip-art and wallpaper images..... \$62.



SPECIAL BUNDLE OFFER!

Intel ... 3 years		
10436	SatisFAXtion Modem/300	239.
5994	Modem/400	399. 5995 Modem/400e 399.
2994	EtherExpress 16 or 3021 16 TP	ea. 129.
Megahertz ... 5 years		
10514	P2144 14.4 Pocket Fax/Modem	379.
10515	C5144 14.4 Fax/Modem (Compaq LTE/Contura)	499.
Microcom		
6234	CarbonCopy Plus 6.1 129. 4410 Windows 129.	
Microsoft		
6141	Windows for Workgroups Add-on (6172 3 1/4")	59.
Norton-Lambert		
2753	Close-Up Dual Pack 4.0 (2754 3 1/4")	125.
Practical Peripherals ... lifetime		
3803	PM14400FX (internal modem/fax)	199.
9234	PM14400FXPPM Pocket Fax/Modem	359.
10570	PM14400FXMT (external modem/fax)	215.
Prometheus ... 5 years		
6444	Ultima Home Office (internal)	289.
Softnet		
5883	FaxWorks 2.5 (Windows & DOS) (3 1/4" only)	45.
Supra ... 5 years		
11441	SupraFaxModem V.32bis Ext. for DOS	299.
11442	SupraFaxModem V.32bis Ext. for Windows	299.
Technology Concepts ... 2 years		
6315	Fax Line Manager 203	125.
TheComplete PC ... 2 years		
8593	TheComplete Communicator Gold	389.
Traveling Software		
4407	LapLink V	99.
Zoom Telephonics ... 7 years		
1494	Ext 9600V.32 195. 3075 Internal 179.	
4430	FaxModem AFX (2400 baud 96S/48R)	69.
4429	FaxModem VFP V.32bis 14,400 baud (internal)	192.
4428	FaxModem VFX V.32bis 14,400 baud (external)	215.
7821	Pocket FaxModem	87.

VIDEO & SOUND

ATI Technologies ... 5 years		
8463	VGA Wonder XL24 149. 2012 Graphics Ultra	209.
3886	Graphics Ultra + (with 2 MB)	339.
3871	Graphics Ultra Pro (with 2 MB)	519.
Boca Research ... 5 years		
10468	SVGAX3 (with Bit BCT acceleration)	149.
8380	BasicVGA 49. 8381 SuperVGA	115.
Creative Labs ... 1 year		
5770	Sound Blaster 16	229.
10906	VideoSpigot for Windows	429.

800-800-0004



PC Connection 693PCM
6 Mill Street
Marlow, NH 03456

SALES 603-446-0004 FAX 603-446-7791

Zoom Telephonics/Delrina Technology

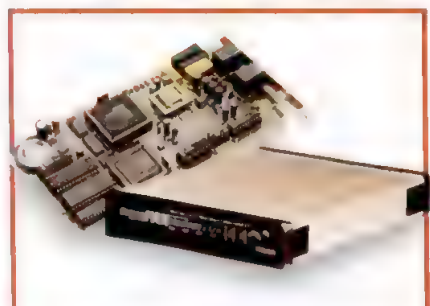
4429 FaxModem VFP V.32bis Internal—Send & receive class one or two faxes at 14,400 bps. Both FaxModems provide V.42bis compression & MNP 2-5 error correction for up to 57,600 bps..... **\$192.**
4428 FaxModem VFX V.32bis External. **215.**
2446 WinFax PRO 3.0—Makes it easy to send, receive & manage faxes from within Windows. Send faxes as easily as you print documents!..... **79.**
Combined they satisfy your total fax needs.
11649 WinFax PRO & FaxModem VFP V.32bis Internal..... **249.**
11632 WinFax PRO & FaxModem VFX V.32bis External..... **269.**

Diamond Computer ... 5 years

11461	SpeedStar Pro	125. 10079 Stealth 24 .. 165.
11306	Stealth Pro 1 MB	249. 11305 2 MB 339.
Huppauge Computer ... 1 year		
10593	Win/TV, Microsoft Video for Windows Bundle	459.
Intel ... 3 years		
11587	Smart Video Recorder	499.
KOSS Corporation ... 90 day		
11323	HD-4 speakers (with equalizer & AC Adaptor)	55.
MediaVision ... 1 year		
5637	ProAudio Spectrum 16 (3 yr.)	199.
11478	ProMovie Spectrum 299. 10735 CDPCLX 1099.	
NEC ... 2 years		
4252	MultiSync 3FGX Monitor (14")	689.
4249	4FG Monitor (15") 799. 3151 5FG (17") 1449.	
Video Seven ... 7 years		
7362	WIN.VGA 1 MB 129. 9261 WIN.PRO 1 MB 179.	

INPUT/OUTPUT

Caere ... 1 year		
8158	Typist Plus Graphics	299.
Canon ... 1 year		
We are an authorized Canon Service Center.		
7809	BJ-200 BubbleJet Printer	355.
9037	BJ-300 469. 9038 BJ-330 529.	
CoStar ... 1 year		
10300	Address Express	689.
Epson ... 2 years		
11495	Stylus 800 (1 year warranty)	379.
5555	AP-3250 (80 col., 200 cps, 24 pin)	199.



Supra ... 5 years

SupraFaxModem V.32bis—Features 14,400 bps fax and data. Comes with choice of DOS or Windows software. External includes cable. DOS: 11440 Int. **\$219.** 11441 Ext. **\$299.** Windows: 11443 Int. **219.** 11442 Ext. **299.**

PC CONNECTION

No way. Way! \$5.



Microtek ... 1 year

5187 *ScanMaker II*—The ScanMaker II and the superfast ScanMaker IIx offer affordable ways to capture 24-bit color or 8-bit gray-scale images at up to 1200 dpi. **\$879.**
5175 *ScanMaker IIx with PhotoStyler*..... **1099.**

2358	LQ-570 (80 col., 252 cps).....	249.
10784	Action Laser 1500 (1 MB).....	889.
10752	ES600C Color Scanner (requires interface kit).....	895.
Hewlett-Packard ... 1 year		
7621	DeskJet Portable.....	439.
6442	LaserJet 4 (with toner).....	1499.
Kensington Microware ... 1 year		
7899	Expert Mouse serial... 99. 7900 bus.....	115.
Key Tronic ... 3 years		
4518	101 Plus Keyboard.....	99.
4387	Trak 101 Keyboard (with trackball).....	165.
Logitech ... limited lifetime		
3996	Trackman2 (combo)..... 79. 2343 Portable....	99.
3295	Mouseman (combo)..... 69. 9766 (cordless)....	89.
Microsoft ... lifetime		
7597	Microsoft Mouse (bus or serial).....	85.
1896	Ballpoint Mouse (serial only).....	119.
2898	Mouse with Windows 3.0 (bus or serial).....	149.
MicroSpeed ... 1 year		
6007	PC-TRAC Trackball serial.....	75.
Microtek ... 1 year		
5187	ScanMaker II 879. 5175 ScanMaker IIx. 1099.	
Mouse Systems ... lifetime		
7676	PC Mouse III (serial)..... 69. 5427 NewMouse ..	82.
Mustek ... 1 year		
8452	Gray Artist for Windows (256 GS hand scanner) 165	
Okidata ... 1 year		
5093	OL400 Laser Printer.....	649.
9590	OL810 Laser Printer.....	1089.
Pacific Data ... lifetime/60 day MBG		
5729	ProTracer (personal CAD printer) (1 yr.).....	1099.

ACCESSORIES

Amazon Power ... 2 years		
7108	Smart UPS 400..... 339. 7105 Smart 600.....	439.
3819	Back-UPS 250..... 115. 3858 Back 400.....	179.
7107	Back-UPS 450..... 215. 3823 Back 600.....	295.



Prometheus ... 5 years

6444 *Ultima Home Office*—Internal, integrated communications system. 14,400 modem, send/receive fax and digital voice messaging, featuring MaxFax voice/fax software... **\$289.**
7776 *Home Office Modem (internal)*..... **179.**

Curtis ... lifetime		
7358	Command Center SPF-4.....	\$79.
Cyrix Corporation ... 5 years		
9875	FasMath 83D87-25 or 9876 83D87-33.....	ea. 89.
Intel ... 3 years		
4750	80387SX..... 79. 5409 80387DX.....	85.
I/O Designs ... lifetime		
8121	Ultimate Laptop SL 52. 8113 Ultimate Laptop EX.....	59.
11371	Ultimate Laptop XL Carry Case.....	65.
Kensington Microware ... 1 year		
Full line available. Partial listing.		
2582	MasterPiece Plus..... 95. 2587 Remote.....	105.
10748	MasterPiece Compact.....	59.
10410	NoteBook Traveler PC Deluxe Case.....	75.
PC Power & Cooling ... 2 years		
9537	CPU Cooler (for 386/33 up to 486).....	29.
3203	Turbo Cool 200 149. 7915 Turbo Cool 300 159.	
Targus ... lifetime		
1305	Universal Notebook Computer Case.....	69.
11207	Leather Notebook Computer Case.....	89.
Tripp Lite ... 2 years		
6199	isobar 4-6 (4 outlets, Gold Seal Warranty).....	49.
6200	isobar 6-6 (6 outlets, Gold Seal Warranty).....	59.
9312	BC500 Power Backup.....	219.

DRIVES

Colorado Memory Systems ... 1 year		
4354	Jumbo 250 Tape Backup.....	215.
1073	Trakker 250 Tape Backup (parallel).....	429.
Conner Peripherals ... 1 year		
2339	CP30104H 120 MB IDE HD (19 ms).....	269.
1337	CP30204 210 MB IDE HD (16 ms).....	349.



WordPerfect Corporation

WordPerfect 5.2 for Windows—Ships with Grammatik 5, ATM, & twelve new fonts.
6228 *WordPerfect Competitive Upgrade*.. **\$99.**
4786 *WordPerfect Version Upgrade*..... **79.**
3494 *WordPerfect 5.2 for Windows*..... **279.**

OMEGA ... 1 year		
6499	Transportable 90 PRO.....	659.
10452	Transportable MultiDisk 150.....	849.
6344	PC Powered 90 PRO (includes PC2B, cartridge & Central Point Software).....	599.
10537	PC Powered 150.....	799.
10457	Dual MultiDisk 150.....	1699.
2530	90 MB Cartridge..... 149. 2467 Tripak.....	439.
8480	Tape250 Insider Tape Backup.....	199.
8481	Tape250 Inside Half-Height Tape Backup.....	209.
10702	Tape250 Parallel Port Tape Backup.....	429.
8482	Tape250 PC Powered Tape Backup.....	319.
NEC ... 2 years		
6582	CDR74-1 Portable CD-ROM Drive.....	629.
6581	CDR84 Internal CD-ROM (reqs. interface).....	569.
Quantum ... 2 years		
8287	Plus Hardcard II XL 105 MB (9 ms).....	279.
4735	Hardcard EZ 127 MB IDE (17 ms).....	329.
4714	Hardcard EZ 240 MB IDE (16 ms).....	549.
TEAC ... 1 year		
6951	1.2 MB Drive for AT.....	59.
4670	1.44 MB Drive (3 1/2").....	55.
4326	1.44 MB Drive (3 1/2", with Eastech).....	75.
4414	3 1/2"/5 1/4" Dual Floppy Drive.....	145.

MEMORY

1411	1 MB x 9 SIMMs (70 nanosecond).....	call
2497	4 MB x 9 SIMMs (80 nanosecond).....	call
5746	1 MB Chips (80 nanosecond, set of 9).....	call
Boca Research ... 5 years		
7150	BOCARAM/AT PLUS (2 MB).....	169.
7139	(4 MB)..... 239. 7138 (8 MB).....	449.
6998	I/O Board for AT... 49. 6999 for PS/2.....	89.



\$784 FREE SOFTWARE VALUE!

Intel ... 3 years

11587 *Smart Video Recorder*—Power and performance! Fifteen times faster for one-step capture and compression of 1/4 screen video onto one-fifth the hard disk space..... **\$499.**

Intel ... 3 years		
1066	Matched Memory Classic Memory Board 2K.....	95.
8479	Above Board ISA 2K.....	179.
Pacific Data ... lifetime/60 day MBG		
Memory upgrade for LJ IIP, III, IIID, IIIP:		
7055	2 MB..... 119. 7759 4 MB.....	199.
7959	4 MB Upgrade for LaserJet 4.....	165.

DISKS/MEDIA

Fuji ... lifetime		
2214	3 1/2" DS Disks (10)..... 9. 2242 (50).....	32.
7379	3 1/2" HD Disks (11)..... 13. 2241 (50).....	59.
4863	3 1/2" HD Disks (20) with storage case.....	25.
Sony ... lifetime		
3292	5 1/4" HD Disks (10).....	11.
3297	3 1/2" DS Disks (10)..... 9. 6148 (30).....	25.
3298	3 1/2" HD Disks (10)..... 14. 6375 (30).....	39.
8185	QD2040..... 14. 1895 QD2120.....	19.
3M ... lifetime		
1581	DC2120..... 22. 11013 (3 pack).....	60.
Tohiba ... lifetime		
4858	3 1/2" 2.88 MB ED Disks (5)..... 17. 9755 (10).....	29.

OUR POLICY

- We accept VISA and MASTERCARD.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
- No sales tax, except Ohio residents (please add applicable tax).
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail.
- International orders U.S. \$100 minimum. Manufacturer support and upgrade eligibility may be limited outside the U.S.A.
- Upon receipt and approval, personal and company checks clear the same day for immediate shipment of your order.
- Corporate P.O.s accepted subject to approval.
- COD max. \$1000. Cash or cashier's check. COD orders require an additional \$4.50 charge. COD orders ship via UPS and may require additional UPS charges.
- 120 day limited warranty on all products. Defective software replaced immediately. Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice (e.g. SIMMs).
- Order lines opened continuously from 8 a.m. Monday until 5 p.m. Sunday ET. Business offices at 603-446-3383 Monday through Friday 9 a.m. to 5:30 p.m. ET.

SHIPPING

Continental U.S.: The total freight charge on any order placed with PC Connection is only \$5. Barring events beyond our control, all credit card orders (no COD orders) phoned in weekdays by 3 a.m. ET will ship Airborne Express for delivery the next business day. Which means same day delivery for orders placed between midnight and 3 a.m. ET. (Some orders may ship by UPS Ground for next day delivery). Saturday delivery available to many areas upon request at no additional charge. Order all day Saturday through noon on Sunday for Monday delivery. (Some areas require an additional day delivery).
Hawaii, Alaska, Canada, Puerto Rico and the U.S. Virgin Islands: Shipping to these areas may require additional time and charges. Call 800-800-0004 for information.
All other areas: Please call 603-446-0004 or FAX 603-446-7791 for information.

There are lots of places to buy off-the-shelf computers. We'll sell you exactly the computer you want



CUSTOM

configured with peripherals and software installed at no extra charge! And not just any computer but a



COMPAQ

Now, you might expect to pay more for a Compaq from a warm and fuzzy company like ours, but they're as



CHEAP

as anywhere! Best of all, if you order your CUSTOM COMPAQ by 10:00 p.m. we'll ship it

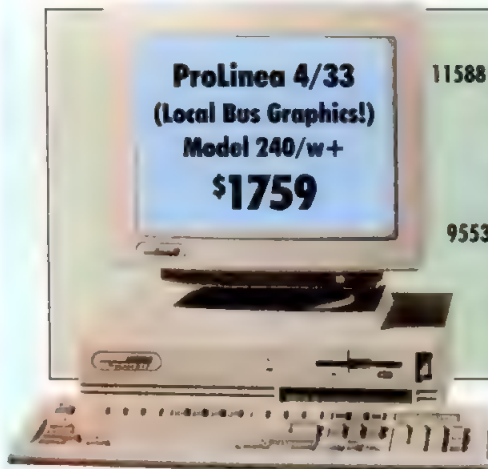


OVERNIGHT. \$5

That's right. Just \$5 shipping. No matter how many Compaqs you order or how many things we stuff them with.

Some people think that just because we have the best-looking mascots in the business, our prices must be high. No way! First, we squeeze our Compaq prices until the bean counters start sweating digits. Then we throw in FREE installation of popular

software and peripherals (like coprocessors, modems, RAM, and storage devices). To top it off we ship your entire order overnight for \$5! You get the most reliable computers from the most reliable source, complete with a 3-year warranty. Ready to run. Overnight.



ProLinea 4/33
(Local Bus Graphics!)
Model 240/w+
\$1759

Here are just a few of the Compaqs we carry:

11588 ProLinea 4/33 Model 240/w+

33-MHz 486DX, 4 MB upgradable to 32 MB,
240 MB Hard Drive, PFS: WindowWorks, MS-DOS 5.0
and Windows 3.1, 5 1/4" Drive, Modem (2400 data,
9600/4800 S/R fax), Prodigy\$1759

9553 LTE Lite 3/25c Color Model 120/w

25-MHz 386SL, 4 MB expandable to
20 MB, 120 MB Hard Drive MS-DOS 5.0
and Windows 3.1\$3499

11646 DESKPRO 4/66M Model 510/w

66-MHz 486DX2, 8 MB expandable to 32 MB,
QVision 1024 Graphics, 510 MB Hard Drive,
MS-DOS 5.0 and Windows 3.1\$3649

9552 Contura 3/25 Monochrome Model 120/w+

25-MHz 386SL, 4 MB expandable to 12 MB,
120 MB Hard Drive, PFS: WindowWorks,
Trackball, MS-DOS 5.0 and Windows 3.1\$1599

Call for our complete price list of Compaqs and the peripherals and software we'll install free.

PC Connection® 800-998-0004

©COPYRIGHT 1993 PC CONNECTION, INC. PC CONNECTION AND THE RACCOON CHARACTERS
ARE REGISTERED TRADEMARKS OF PC CONNECTION, INC., MARLOW, NH

FACT FILE

Interactive Unix, Version 3.0.1

SunSoft Inc., 2550 Garcia Ave., Mountain View, CA 94043; 800-227-9227, 415-960-3200; fax, 415-336-0362

List price: Basic package for two users, \$495; complete package for unlimited users, \$3,195.

Requires: 386-based PC or better, 4MB RAM (8MB recommended), 120MB hard disk space

In short: Superior system administration tools, an excellent GUI, and stability are overshadowed by so-so DOS support and lack of non-TCP/IP protocols. Still, this product is good for small, Unix-oriented companies.

486 ON READER SERVICE CARD

For programmers, Interactive comes with two C compilers, a full-fledged context-sensitive editor, and a source-level debugger. Source code is provided for X Window System 11 Release 5, and you also get access to the Motif toolkit.

CALLING ALL SMALL BUSINESSES

Users who want to use a GUI, not write one, will enjoy Visix Software's Looking Glass 2.01, Interactive's bundled GUI desktop manager. Looking Glass's Motif-based user interface, ease of customization, and speed gives us what we want from a GUI: a way of getting more work from the machine without any hassles.

Interactive's documentation is plentiful, and we found the customer-support technicians (available for the price of a call) to be friendly and well-informed.

Interactive may not be as fancy as some of the other systems in this roundup, but then none of the others could run with as little memory and with just a 386SX. Popular Unix and DOS business software ran flawlessly. Interactive is a stable, tried, and tested product that makes an ideal backbone operating system for a small business. While it doesn't have the bells and whistles of UnixWare or SCO Open Desktop, users who are already comfortable with Unix may find it the ideal platform for their homes and offices. But if you're not already sold on Unix, this might not be the place to begin.

The Santa Cruz Operation Inc.

SCO Open Desktop

BY STEVEN J. VAUGHAN-NICHOLS

To many people, Unix on the x86 platform is synonymous with SCO Open Desktop, from The Santa Cruz Operation (SCO). SCO dominates today's tiny x86 Unix market. Whether it will continue to be a big fish in a small pond or grow to be a shark in the larger waters of the 32-bit OS ocean remains to be seen.

Based on the Unix System V Release 3.2 engine (the mainstream Unix of the mid-1980s), Open Desktop has gone its own way and not followed the Unix revisions to SVR4. Casual users won't be able to see the differences, but from a programmer's and system administrator's perspective, Open Desktop is quite different from Unix systems based on the kernels that were developed later.

This is not to say that Open Desktop is a lumbering dinosaur from Unix's past. For instance, the latest version includes a new file system that supports files with long names, just like today's SVR4-based

versions of Unix. Nor does it mean that Open Desktop is isolated from the Unix mainstream. SCO's Unix products take the Tyrannosaurus rex's share of the x86 Unix market, and software vendors almost always support the SCO Unix line.

OBJECT-ORIENTED GUI

Open Desktop's X Window System 11 Release 4, combined with a Motif window manager and an enhanced IXI X.desktop desktop manager (SCO recently acquired IXI), presents users with an excellent interface similar to OS/2's object-oriented Workplace Shell.

Though the execution is not quite on a par with the Workplace Shell or NeXTStep's interface, Open Desktop's icons can be used in an object-oriented fashion. For example, moving an icon from one place to another

moves all the icon's associated files and properties; Open Desktop makes sure that the application can still find its executables and data files without manual intervention.

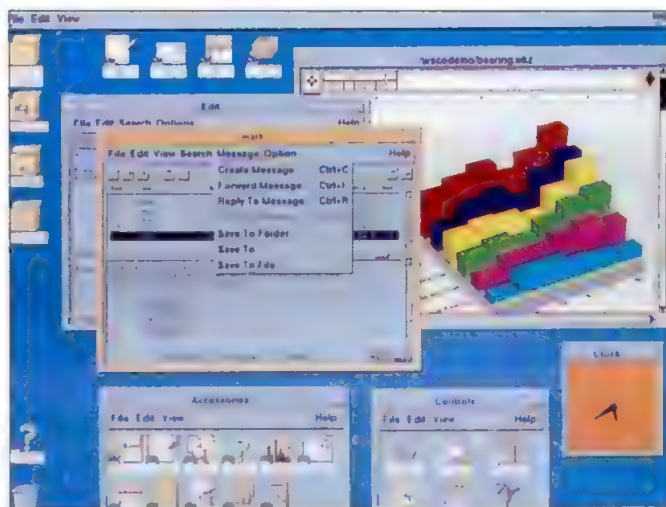
Of all the systems we reviewed, the Open Desktop interface offers the most consistent match between the GUI and the underlying OS. NeXTStep and Solaris excepted, with the other systems

expert users will find themselves heading for a terminal screen to get work done more quickly. Not with Open Desktop.

APPS RUN DEEP

The base-priced package comes with the usual Unix applications: e-mail, text editors, a calculator, and the like. Users who want more will be quite pleased to discover that there are more native applications

SUITABILITY TO TASK				
SCO Open Desktop				
	POWER	FILE	CODE	EFFICIENT
Networking	●	●	●	○
DOS Environment	●	●	○	○
GUI Integration	●	●	●	●
Administration	●	●	●	○
Multitasking	●	●	●	○



SCO Open Desktop's excellent object-oriented GUI is similar to OS/2's Workplace Shell. Unlike with some other systems, expert users won't find themselves bypassing the GUI to work more efficiently.

Finally, full-motion video for your PC.

See us at
CES Booth #7115
And COMDEX Booth #6832

Now you can create full-motion video and multimedia presentations right on your desktop PC with Video Blaster™ hardware and Microsoft® Video for Windows® software. Everything you need is right in the Video Blaster box.

Complete video hardware PLUS full-motion multimedia software...



*Microsoft Video for Windows:
puts the power of full-motion digital
video onto your PC screen.*

Video Blaster lets you capture, freeze, store, manipulate and export fully-scalable digital video images from as many as three sources (both PAL and NTSC).

Video for Windows software adds Windows-compatible, Audio-Video Interleave (AVI) format to your Video Blaster hardware. So you can now capture and store full-motion video and incorporate it into OLE-compatible applications.



**MacroMind
Action! for
Windows.**

Use the two together to produce and edit full-color digital video sequences in a resizable window. Combine still and moving video with computer-generated graphics and animation, or overlay text and graphics onto live video. With just

these tools and a video source, you've got an entire multimedia video studio on your desktop.

To add CD-quality 16-bit stereo sound and on-screen digital mixing, just plug in a Sound Blaster™ 16 ASP™ or other Sound Blaster audio card. Your presentations will sound as good as they look.

Included in your Video Blaster package is over \$1500 in software—including Macromind Action!™ and Temptra™ presentation packages for DOS or Windows environments. Plus Creative Labs'

Video Kit for special effects and JPEG compression software to store images in a fraction of the disk space required by other PC video systems.

...all in one package.



*Special Edition
Temptra GIF and
SHOW: for DOS.*

It's the complete multimedia authoring and editing solution. Everything you need to

get rolling with full-motion multimedia video... and all at a price you can afford.

For more information and the name of your nearest dealer, call 1-800-647-9933.

**Creative Labs and Microsoft
team up to offer state-of-the-art
PC video for less than \$500.***



Microsoft
VIDEO
FOR WINDOWS

Video
BLASTER

CREATIVE
CREATIVE LABS, INC.



*MSRP \$499.95. If MS Video for Windows is not included in your Video Blaster package, a copy can be sent to you at a special offer price. Call 1-800-647-9933.
© Copyright 1992 Creative Labs, Inc. Video Blaster, Sound Blaster, and ASP are trademarks of Creative Labs, Inc. All other trademarks are owned by their respective companies.
International inquiries: Creative Technology, Ltd. Singapore, TEL 65-733-0233 FAX 65-773-0353.

CIRCLE 086 ON READER SERVICE CARD

available for Open Desktop than for any other x86 Unix—more than 3,000. Microsoft Word, for instance, is available in a SCO Unix version. Open Desktop also supports the hundreds of SCO Xenix programs that are still in circulation and still being produced today. One small annoyance, though, is that SCO “presells” some software packages: Open Desktop comes already set up with icons for Microsoft Word and SCO Office Portfolio, though neither comes bundled with the system.

SCO also scores high for making hardware compatibility issues less frustrating. Included with the Open Desktop documentation is a 134-page booklet detailing just what hardware is and isn’t compatible with Open Desktop.

Open Desktop comes with the standard array of TCP/IP and NFS network facilities. These include telnet and rlogin, which let you log on to other systems on the network. You can use ftp (file-transfer protocol) to copy files between systems. You can also “mount” disks or directories on other systems, which allows

FACT FILE

SCO Open Desktop, Version 2.0

The Santa Cruz Operation Inc., 425 Encinal St., P.O. Box 1900, Santa Cruz, CA 95061;
800-726-8649, 408-425-7222;
fax, 408-458-4227



List price: Basic package for two users, \$1,295; complete package for unlimited users, \$4,290

Requires: 386-based PC or better (486 or better recommended), 8MB RAM (12MB recommended), 120MB hard disk space

In short: Take one box of SCO Open Desktop, add it to your system, and voila! instant workstation. It offers an excellent GUI, a host of business apps, and support for NetWare and Microsoft LAN Manager networks.

You should certainly consider Open Desktop



ON READER SERVICE CARD

you to access these directories as if they were on your local system. Open Desktop also includes a built-in Microsoft

LAN Manager client, which lets you share disk and peripheral resources across any LAN Manager network.

Another strong suit of Open Desktop is its support for DOS. You can access your DOS files (resident either on floppy disks or as a partition on your hard disk) and manipulate them by using the standard Unix utilities; in other words, your DOS files will be treated as if they were Unix files. You can run DOS 5.0 sessions from Unix merely by typing “dos” at a system prompt or clicking on the DOS icon. You can also run multiple DOS sessions, but be warned that each session will cost you at least 2.5MB of RAM. Version 2.0 supports Microsoft Windows 3.0.

OF ADMINISTRATORS AND DEVELOPERS

In this newest version, the implementation of C2-level security has been tamed a bit; you can now run Open Desktop without fear of finding yourself locked out of the system. Administrators can install Open Desktop from CD-ROM, quarter-inch tape, or floppy disks.

For developers, Open Desktop in-

A mean time between failure of 20.5 years means you will never have to worry about 3Com's TokenLink III adapters.

The confidence of your peers: 3Com is an award-winning supplier in the networking industry.

Better reliability costs nothing extra. 3Com TokenLink III adapters are surprisingly affordable.

A universal boot PROM lets you download existing IBM drivers from popular operating systems, such as NetWare, LAN Server, LAN Manager, and Banyan Vines.

A unique 3Com TokenLink III feature: an RPL utility to facilitate easy remote downloading of network drivers.

Need 32-bit EISA? Rest assured, 3Com TokenLink III 32-bit EISA adapters are available for this machine.

3Com TokenLink III adapters fit seamlessly with 3Com Token Ring hubs, bridge/routers, and network management software. They're part of a total Token Ring solution from 3Com.

Install TokenLink III exactly as you would any IBM 16/4 Network Adapter or Adapter/A. It's that easy and familiar.

Works with your existing IBM drivers so compatibly, we don't ship TokenLink III with any drivers at all. Just plug in TokenLink III and start networking.

Available off the shelf from thousands of authorized 3Com resellers worldwide.

Five million computers have been hooked up to networks using 3Com adapters. No other company has more experience in adapter technology.

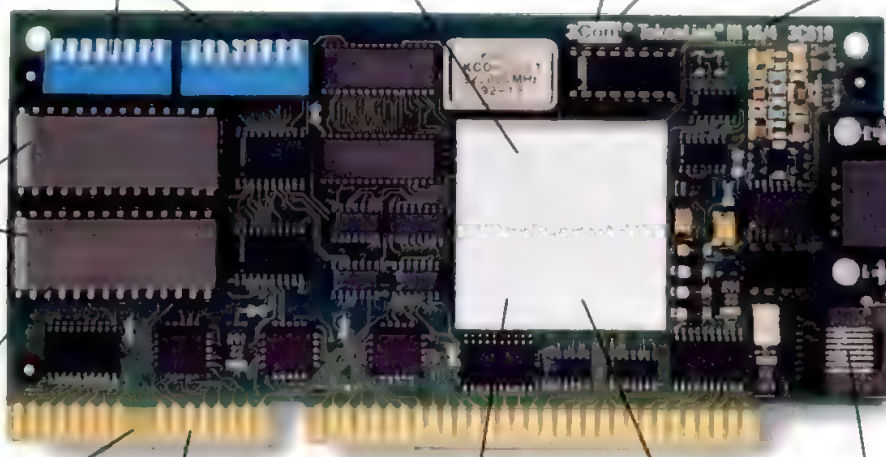
Lifetime warranty. If a 3Com TokenLink III adapter fails during the life of your machine, we will repair or replace it free of charge.

Supports 16 Mbps and 4 Mbps over shielded and unshielded twisted-pair.

First to be SNMP manageable. 3Com's LinkWatch™ Token Ring software provides feature-rich, driver-integrated SNMP agents. Also manageable under IBM LAN Network Manager and NETView.

No jumpers or switches to set for unshielded twisted-pair or shielded twisted-pair connections.

Local service and support is easily available through 3Com's worldwide network of partners and distribution.



16-bit performance. Not just 8-bit.

Money-back guarantee if TokenLink III is not 100% compatible with any application or driver that runs on either an IBM 16/4 Network Adapter or Adapter/A.

IBM-designed TROPIC chip guarantees full IBM compatibility.

On-board, unshielded twisted-pair connector comes standard with 3Com TokenLink III adapters. No need to pay extra for external media filter.

cludes two C compilers: *rcc* (the standard Unix AT&T C compiler) and *cc* (Microsoft's C 6.0 for Unix). In addition to various development utilities (make, Source Code Control System, and lint), the development package includes debuggers and facilities for DOS program development. If you want to cross-develop for

for the first 30 days; after that, a yearly contract will cost you \$895 per year.

VERSION 3.0

Version 3.0, due for release as we went to press, will include support for NetWare and Windows 3.1, including networked Windows applications. It will also have X Window System 11 Release 5, bringing font-server capabilities for downloadable fonts. Those additions, plus Open Desktop's plethora of existing programs, consistent user interface, and superior DOS compatibility, make this OS a choice to consider.

Univel

UnixWare

BY MARK WALLACE

For a fledgling product in its first release, UnixWare has an interesting lineage. It's based on USL's Destiny, the same SVR4.2 kernel that Consensys V 4.2 is based on. But UnixWare's ties to its maker are much stronger. Novell and

USL got together to form Univel, which released UnixWare; shortly after the release, Novell bought out USL and now is the sole owner of UnixWare.

As its parentage suggests, UnixWare (available in both personal and networked editions) marries the strengths of DR DOS 6.0, NetWare, and SVR4.2. While Consensys Corp. remained true to SVR4.2 and ships a rather pure version, Univel built upon SVR4.2 to produce an outstanding hybrid NetWare/Unix product.

UnixWare Personal Edition (\$495) can act as a NetWare client, runs DOS 5.0-compatible applications, and supports all types of x86 Unix applications. Univel has also recently decided to include Locus Computing Corp.'s Merge utility, which adds support for Microsoft Windows 3.0 and Standard-mode Windows 3.1. The \$1,299 UnixWare Application Server edition, which we reviewed, additionally includes the traditional Unix networking solutions: NFS and TCP/IP. It also adds a suite of Personal Utilities for power users and system

SCO Open Desktop 3.0 will support NetWare and Windows 3.1, including networked Windows apps.

both Unix and DOS, Open Desktop is the operating system for you.

SCO has refined the presentation of the product as well. The information in the newer documentation is much more accessible, both in style and format. Technical support is available from a variety of forums, including an 800 number and e-mail. Technical support is free only

IBM compatibility. That was the easy part.

You'd like a Token Ring adapter that was 100 percent compatible. 100 percent reliable. And 100 percent guaranteed.

But why settle for that?

With 3Com's TokenLink® III Token Ring adapters you get the IBM®-designed TROPIC™ chip, a lifetime warranty, and a money-back guarantee. But that's just for starters.

There's also a universal boot PROM with the Remote Program Load (RPL) utility, so you can easily download existing IBM drivers from all the popular network operating systems. A choice of adapters for 32-bit EISA, 16-bit ISA, or 16-bit Micro Channel® machines. And a choice of unshielded twisted-pair or shielded twisted-pair at 4 or 16 Mbps. No other IBM-compatible adapter family offers such flexibility.

And no other IBM-compatible Token Ring adapter company has more experience in making adapters, either. More

than five million computers have been hooked up to networks using 3Com adapters.

And if all these extras sound expensive, you are in for a very pleasant surprise. 3Com® TokenLink III adapters cost less than IBM-compatible adapters while offering much more.

But why not see for yourself? Call 1-800-NET-3Com for the name of the authorized 3Com reseller nearest you. And find out how the easiest job of all is running with 3Com TokenLink III adapters.



Networks That Go the Distance™

CIRCLE 293 ON READER SERVICE CARD

Unix on Intel

administrators, and supports an unlimited number of users.

INSTANT CONNECTIVITY

Communication between NetWare and TCP/IP is the central feature of UnixWare, and the package handles it well.

SUITABILITY TO TASK

UnixWare

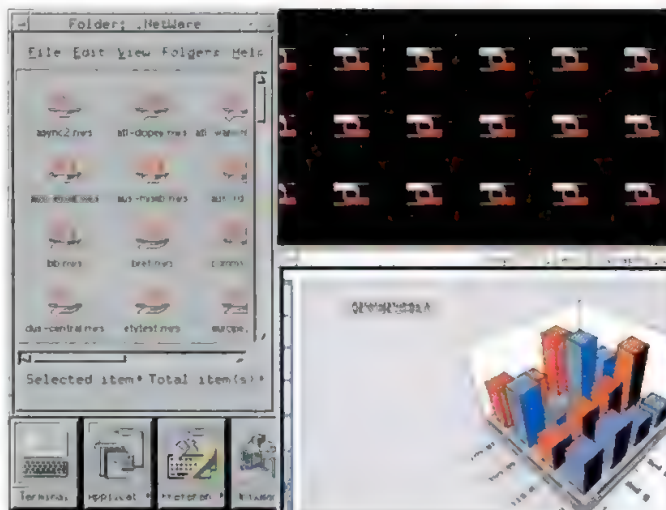
	FILE	FILE	FILE	FILE
Networking	●	●	●	●
DOS Environment	●	●	●	○
GUI Integration	●	●	●	○
Administration	●	●	●	○
Multitasking	●	●	●	○

UnixWare acts as a NetWare client using IPX/SPX out of the box—no special configuration required. While the NetWare connection is worthy of praise, configuring UnixWare to work as part of a TCP/IP network requires a little more work, careful attention to the instructions, and an occasional hurling of an epithet. Still,

within an hour we had connected not only to our NetWare server with IPX/SPX, but also to our SPARCstation II clone running Version 2.1 of Solaris for x86 along with TCP/IP. The end result is a system that can exchange information and applications with all systems.

DOS users can use Novell's virtual terminal programs (included in the package) to exploit Unix's power. Unix users can use NetWare applications from servers on the NetWare network. Some applications, like the included e-mail package, integrate seamlessly across the boundary.

During our testing, UnixWare per-



UnixWare's intuitive and flexible GUI includes easy access to several of Unix's most powerful and attractive features, such as scheduled tasks and automatic program execution.

formed well. It was possible to overload the system (by running multiple local applications while the disk was accessed by remote NFS clients, for instance), but under normal conditions the system hummed like a top. We also found Unix-

YOU CAPTURE THE IMAGES



Unix on Intel

Ware's networking facilities to be fairly robust.

EXTRA OPTIONS, EXTRA VALUE

UnixWare is very configurable. The SVR4.2 desktop GUI, based on X Window System 11 Release 5, is intuitive and flexible. Both Motif and Open Look windows managers are available.

The preferences editor contains 15 categories (color schemes, printers, and the like), each of which can configure at least half a dozen options. While the options could be organized better, Univel's well-thought-out defaults reduce configuration errors. Some changes, though, shouldn't be made. We added a user, then changed that user from the GUI to a character-based log-on. This change couldn't be reversed. Personal Edition ships with two manuals, while Application Server provides ten. The documentation is organized and clear, and UnixWare offers outstanding on-line help.

The GUI includes easy access to several of Unix's most powerful and attractive features, such as scheduling tasks and



FACT FILE

UnixWare

Univel, 2180 Fortune Dr., San Jose, CA
95131; 800-486-4835, 408-729-2300



List price: Basic package for two users, \$249, complete package for unlimited users, \$2,495

Requires: 386SX-based PC or better, 8MB RAM (12MB recommended), 80MB hard disk space

In short: If you're serious about migrating to a 32-bit operating system, you need to consider UnixWare. Univel has created a great product that compares very favorably with Windows NT and OS/2. It is nirvana for NetWare users and boasts good application support.

ON READER SERVICE CARD

automating program execution. These are powerful, often underrated features of Unix, and they've rarely been this easy to use before. System administration can be done through the GUI as well, or through a character menu-based pro-

gram (sysadm), which is standard on all the SVR4-based systems we reviewed.

THE APPLICATION FRONT

There's a respectable and growing stable of applications available for SVR4-based Unix systems, including WordPerfect, Lotus 1-2-3, FrameMaker, Interleaf, and Informix. UnixWare will also run SCO Xenix, SCO Unix, Interactive Unix, and BSD Unix 4.2 applications.

Unlike the other systems we reviewed, which all run MS-DOS using various emulation and virtual-session capabilities, UnixWare includes DR DOS 6.0 support. Interoperability was fairly painless. We were able to copy files from DOS floppy disks to the Unix file system with the normal DOS COPY command. Most file transfers went smoothly. Our WordPerfect and Lotus 1-2-3 files, for example, moved from DOS to UnixWare and back again without a hitch.

Once UnixWare was properly installed, the system was a pure pleasure to use. We were able to run WordPerfect for Unix from the local disk, WordStar

**KODAK
SETS
THEM
FREE**



Scanners. CD drives. Imaging software. They're all great tools to help you capture a color image. Now there's an affordable way to turn those images into prints.

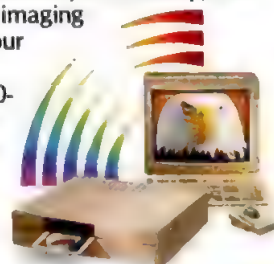
The KODAK 450GL Digital Color Printer. Print 4"x5 1/2" continuous-tone images in less than a minute. With specific models for your MACINTOSH Computer or WINDOWS Software.

Capture one for your desktop, and turn loose the imaging potential of your computer.

Call 1-800-344-0006 for a sample print and dealer information.

Because nobody knows color like Kodak.

Kodak and the Kodak logo are registered trademarks of Eastman Kodak Company. The 450GL is a registered trademark of Eastman Kodak Company. © 1994 Eastman Kodak Company. All rights reserved. For more information, visit us online at www.kodak.com.



**KODAK
450GL**
Digital Color Printer

Which means they never talked to John, Tilman, Nancy, Neal or any of the other CompuAdd Express staff. Because our staff is more than good—they're experienced. So if you're a first time caller you'll find a courteous, well-informed sales staff

award-winning remote communications software, our technical support staff can dial up your system, diagnose configuration and setup problems and properly configure your system for you.



Whoever said good help is hard to find never called CompuAdd Express.

that has the answers and information you're looking for. If you're a current customer, you know how efficiently your concerns are taken care of by our customer service representatives, too. With an average of 9 years experience, they have the knowledge to respond quickly to your problems. In fact, you never have to wait long for an answer from CompuAdd Express. Because we provide some of the quickest service in the business.

Our technical support staff is fast and helpful, too. With an average of 5 years experience, they really keep things moving. One way they do it



is with Remote Rescue. So they can actually solve your problems online. Using Close-Up 4.0, the

But being good just isn't enough. At CompuAdd Express we offer more standard service features with every system—like the ones listed below.

Express Sets The Standard For Good Help

- * Remote Rescue online technical support
 - * 30-day money back guarantee
 - * One-year limited warranty covering replacement or repair of defective hardware
 - * Rapid repairs
 - * Toll-free technical support
 - * Toll-free fax for service
 - * Express technical bulletin board
 - * The convenience of Express Leasing
 - * Easy credit when you have an Express credit card
-

A friendly, experienced staff backed by outstanding service? Looks like good help isn't that hard to find after all. Just call 1-800-925-7811 today.

We accept MasterCard, VISA, CompuAdd Express Charge, money orders, certified checks (please allow ten days for processing), CODs (minimum order \$50), company and institutional purchase orders (minimum initial purchase \$250, thereafter \$50 with approved credit) and wire transfers. Shipping charges are calculated according to weight and distance. Texas residents, please add appropriate local sales tax. CompuAdd Express will replace or repair defective hardware, software and consumable items. A 15 percent restocking fee may be charged. All returned items must be accompanied by a return merchandise authorization (RMA) number. CompuAdd Express sells and services equipment within the United States only and will pay no customs, duties or tariffs on returned merchandise. Prices and product descriptions are subject to change without notice. CompuAdd Express is not liable for damage due to omissions or typographical errors. A copy of our limited warranty is available prior to sale from your sales representative. MS DOS 6.0, Windows 3.1, Lotus software and Close-Up 4.0 are OEM versions.

All Express Notebooks Include:

Cyrix CX486SLC processor rated at 25MHz.



Built-in 9600 baud fax/2400 baud modem, both send/receive.

Serial and parallel ports, PS/2 keyboard connector.

1.44MB 3.5" internal floppy drive.

Math coprocessor built-in.

External VGA video connector for simultaneous display.

Display controls beside the screen on the right.

Two warnings when battery is low—a beep and a blinking light.

Two ways to charge batteries—in notebook or optional battery charger.

Standby button shuts down display and drives when you close the lid.

Easy-to-use built-in mouse trackball, click buttons on left side.

Conveniently located inverted "T" arrow keys.

Automatic virus protection.

Now shipping with MS DOS 6.0.

FREE Windows 3.1, MS DOS 6.0, LotusWorks 3.0, Close-Up 4.0, math coprocessor, NiCad battery, free AC adapter and carrying case—OVER \$700 VALUE!



REMOTE RESCUE Our Exclusive Online Technical Support.

It's technical support you can't afford to be without—support that's quicker and more effective than ever, because we can actually solve your problems online. Remote Rescue uses Close-Up 4.0, the award-winning remote communications software program that lets our Technical Support staff dial up your system, diagnose configuration and set-up problems and properly configure your system for you. And the software is preinstalled FREE on every CompuAdd Express system.

Express 425ColorPlus



Express 425ColorPlus

- Active Matrix LCD display with 640x480 resolution for 256 colors.
- 200MB IDE hard drive.
- 8MB RAM expandable to 20MB.
- Display measures 8.5" usable diagonally.
- Built-in SCSI II interface (50-pin).
- Up to 2 hours of battery life.
- Only 6.6 pounds, including battery.

\$3,995

Lease for only \$147/mo.

Express 425Color



Express 425Color

- **New low price—SAVE \$200!**
- Passive Matrix LCD display with 640x480 resolution for 256 colors.
- 120MB IDE hard drive.
- 8MB RAM expandable to 20MB.
- Display measures 8.5" usable diagonally.
- Up to 2 hours of battery life.
- Only 6.6 pounds, including battery.

\$2,595

Lease for only \$95/mo.

Express 425XL



Express 425XL

- 64 levels of grayscale.
- 120MB IDE hard drive.
- 4MB RAM expandable to 20MB.
- Display measures 9.5" usable diagonally.
- Up to 3 hours of battery life.
- Only 6.3 pounds, including battery.

\$1,995

Lease for only \$73/mo.

Call to order, for other configurations or to request a free catalog.

CompuAdd
Express

1-800-925-7811 Code 358

12301 Technology Boulevard,
Austin, Texas 78727
Hours: 8am-8pm (CST) M-F
512-219-1800 Fax 512-219-2890

► SUMMARY OF FEATURES

32-Bit GUI Unix

Products listed in alphabetical order

■ = YES □ = NO

PC EDITORS' CHOICE**REVIEWED PRIOR TO RELEASE**

	Consensys V4.2	Dell Unix System V Release 4	Interactive Unix	SCO Open Desktop	UnixWare	NeXTStep for Intel Processors	Solaris for x86
List price:							
Basic package—two users	\$249	\$495	\$495	\$1,295	\$249	\$795	\$795
Basic package—unlimited users	\$695	\$795	\$895	\$2,495	\$495	\$795	Info not available
Complete package—two users	\$795	\$995	\$2,635	\$3,090	\$1,299	\$1,995	Info not available
Complete package—unlimited users	\$1,295	\$1,295	\$2,635	\$4,290	\$2,495	\$1,995	Info not available
Unix kernel	SVR4.2	SVR4.0.4	SVR3.2.3	SCO Unix 4.0.0	SVR4.2	BSD 4.3/Mach/ NeXT	SVR4/ Solaris 2.0

Interface

X Window options supported:							
System 11 Release 4	□	■	■	■	■	□	□
System 11 Release 5	■	■	□	□	■	□	■
Window managers supported:							
Motif	■	■	■	■	■	□	■
Open Look	■	■	□	□	■	□	□
Desktop managers supported:							
Looking Glass	□	□	■	□	□	□	□
X.desktop	□	□	□	■	■	□	□
Other	USL Desktop Manager	None	None	None	USL Desktop Manager	Workspace Manager	OpenWindows
GUI applications included:							
E-mail	■	■	■	■	■	■	■
Text editor	■	■	■	■	■	■	■
End-user help:							
Command-line	■	■	■	■	■	■	■
GUI help engine	■	■	■	■	■	■	■

Administration

Distribution media:							
Tape format	DC-6X	DAT, DC-6X	DAT	DC-6X	QIC-24	N/A	N/A
CD-ROM	□	□	□	■	■	■	■
3.5-inch floppy disk	■	■	■	■	■	■	□
5.25-inch floppy disk	■	■	■	■	□	□	□
Via network	□	■	■	■	■	□	■
C2-level security	■	□	■	■	■	□	■

DOS and Windows Support

DOS support:							
Version	None*	MS-DOS 5.0	MS-DOS 3.3	MS-DOS 5.0	DR-DOS 6.0	None*	MS-DOS 5.0
Supports multiple DOS sessions	N/A	■	■	■	■	N/A	■
Microsoft Windows support:							
Windows 3.0	□*	□	■	■	■	□*	■
Windows 3.1 (standard mode)	□*	□	□	□*	■	□*	■

Network Support

Network protocols supported	TCP/IP	TCP/IP	TCP/IP	TCP/IP	SPX/IPX, TCP/IP	TCP/IP	TCP/IP
Asynchronous network protocols supported	PTP, SLIP	SLIP	PPP, SLIP	PPP, SLIP	None	None	None
Network file systems supported	NFS; RFS (optional)	NFS, RFS	NFS (optional)	NFS, NIS, RFS	NFS	NFS	NFS (optional)

Miscellaneous

C compiler included	■	■	■	■	■	■	■
Binary compatibility:							
SCO Unix	■	■	■	■	■	□	■
SCO Xenix	■	■	■	■	■	□	■
SVR2	■	■	■	■	■	□	■

N/A—Not applicable: The product does not have this feature

* This feature is scheduled for inclusion by the time this issue goes to press

■ Unix Development Tools

by David S. Linthicum

Unix is well-known for the robust, bulletproof development environment it supplies to programmers, a feat due in large part to the unofficial Unix credo: "Build on the work of others." From its first single-user release in the 1960s, Unix has been in constant development and redevelopment, primarily in schools and universities where it first found a home. Over the years some pretty smart people created a number of Unix development tools.

Unix was created for programmers by programmers. The hundreds of utilities and the ways they function by themselves and as a team make the Unix environment extremely programmer friendly. Some of these programs are beginning to look a little old and worn, but they were true innovations, and they provide Unix with its power. Since many of these programs port easily to DOS as well as to other operating systems, many DOS developers may recognize one or more of these utilities. Let's look at a few.

- **awk:** Named after its developers, Aho, Weinberger, and Kernighan, this utility can search a file for lines that match a particular pattern and perform some preprogrammed action on each pattern located.
- **yacc:** Yet Another Compiler Compiler aids in the development of compilers, interpreters, and complex programs. Ever wanted to create your own programming language? Here's your chance. The developer need only sup-

ply yacc with a set of rules describing the custom command language and the actions performed for each command during processing.

- **lex:** Lexical analyzer, used for command processing by developers. The lex utility is compatible with C programs. The developer supplies lex with a set of rules identifying the acceptable commands, and the utility produces routines that execute the lexical analysis of the command lines as submitted.
- **scs:** Source Code Control System provides a library for the management of source code. All changes to program code are identified and maintained by this utility.
- **make:** A utility that enables developers to compile multimodule programs. It recompiles only those modules that have been altered since the last time the program was compiled. This utility saves a tremendous amount of development time. The make utility is distributed with most major DOS- and Unix-based compilers.

THE PAYOFF

The real horsepower of Unix lies not in the utilities provided with the operating system (remember, you can find DOS versions of most of them), but in the way they are implemented from Unix: through the Unix *shell*, Unix's command environment. The features that the shell provides include advanced piping, redirection operations and forking operations, and the ability to run several programs simultane-

ously in the multitasking Unix environment. The shell, which comes in a variety of flavors, passes user commands to the kernel, one at a time. Multiple commands process themselves via *shell scripts*, which are functionally equivalent to DOS batch files but make batch files look like Neanderthal programming in comparison. The shell scripting language, in conjunction with the utilities, can function as a full-blown programming language, able to do everything from advanced relational database operations to interprocess communications.

Off-the-shelf advanced development tools (such as debuggers, object browsers, code formatters, and syntax checkers) are becoming more widely available on Unix platforms and supplement the tools of the standard Unix development system. These newer, more attractive interfaces operate on standard terminals as well as under the X Window and Motif graphical environments. Many of these development tools come from the DOS world. Symantec Corp., for example, has implemented its Zortech C++ development system on both the DOS and Unix operating systems.

"After going to Disney world, the county fair just never seemed to measure up," a Unix programmer was heard to say when comparing the Unix and DOS development environments. Combined with the power of Unix itself, Unix development tools provide an ideal programming environment. □

in a DR DOS window from the NetWare server, Bradford Business Systems' SpeedEdit (a programmer's editor) from the SPARCstation, and play solitaire in Microsoft Windows 3.0 Real mode in a DR DOS window—all simultaneously! Oh yes—at the same time we were searching for a text file on the UnixWare system from the SPARCstation. If you want cross-system, cross-network integration, look no further than UnixWare.

DOES THE SHOE FIT?

Should you buy UnixWare? For two different types of users, the answer is clearly yes. The first type needs interoperability and transparent communication between NetWare and TCP/IP networks, and also needs the resources to manage such interoperability. The second type of user needs an upgrade path to the more powerful world of Unix applications, but wants to preserve his or her existing in-

vestment in hardware and information.

These two types make up the core of the market segment for which Univel is reaching. More surprising (and pleasing for Unix aficionados), this OS will appeal to those who are looking for a good, solid version of Unix that emphasizes Unix's strengths—communications and power—while redressing some of its failings—ease of use, for example. This just may be the Unix for the masses. □

Compudyne™ Notebooks. More Of What

Compudyne is the PC manufacturing and direct marketing arm of Comp USA™, The Computer SuperStore (NYSE symbol: CPU)—inventors of big volume, deep discounting PC retailing, and the largest chain of computer super stores in the country. Compudyne manufactures top quality, fully-supported computers as available from only the largest PC manufacturers, at prices typically found only at garage shop clone houses.

Result? We're already one of the largest direct PC companies in the country and guarantee that our prices are the lowest of any currently advertised.

INTERNAL OPTIONS: (USER INSTALLABLE)

- Math Co-Processor
- Memory Upgrades: 2 or 4 MB on 386, 4 or 16 MB on 486
- 2400 bps Data Modems with: 4800 bps send-only FAX, or MNP-5 & 9600 bps send/receive FAX

EXTERNAL OPTIONS:

- External 5.25" Floppy Drive
- External Numeric Keypad
- Expansion Station
- Auto Adapter
- Standard or Leather Carrying Bag
- Spare NiCad Battery



Actual size!

Expansion Station Connector

AC Adapter Connector

Combination external keyboard - PS/2™ mouse connector

Full 10", VGA screen with 640 x 480 resolution, 64 grayscale, brilliant LCD and ultra fast 150 MS response time. (No more disappearing mouse pointer!)

Every Compudyne Notebook comes preloaded with Microsoft® DOS 6.0, Windows™ 3.1 and Lotus® Organizer Personal Information Manager!

Built-in trackball.

Full size 84 key keyboard with 36 function keys including dedicated 'Page Up/Down', 'Home' & 'End' keys. A delight for spreadsheets!

Internal 3.5", 1.44 MB floppy drive.

Ultra-long life 24 watt battery pack with 12 AA NiCads.

Stand-by on 386 models lets you change batteries without switching off!



You Want. Less Of What You Don't.

SUPPORT & WARRANTIES:

- 30-day no-questions-asked return policy**
- Toll-free telephone technical support
- 1 year limited warranty on parts and labor



"With a Graphics Winmark score of 2.3 million, the Compudyne 486DX/33 gives you desktop performance and storage in 7.6 pounds of travel weight."



(8/92)

"...You'll be hard-pressed to find a unit with a better blend of speed, portability, and quality construction than the SlimNote."



(8/92)

"The Compudyne SlimNote 4DX/33... (uses) a marvelous design that wraps a 33 MHz 486DX in a package just over 6 lbs. (This was one) of our favorites."



(12/92)

"For the quietest slimmest notebook, get the Compudyne 486DX/33."



(9/92)

"...Inexpensive, highly portable, good battery life, big screen, great keyboard with built-in trackball."

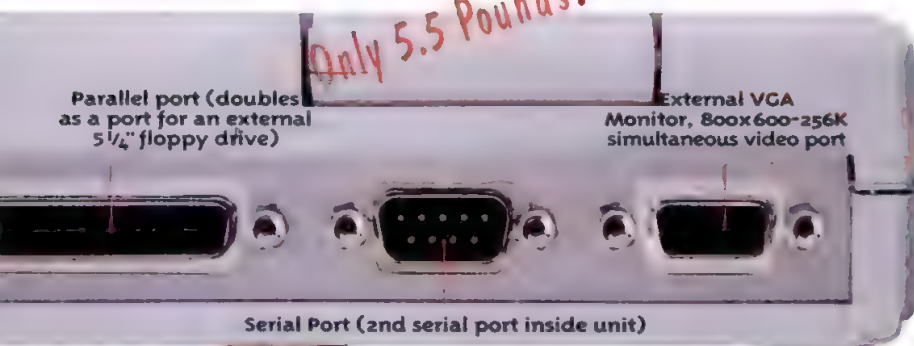


(9/92)

"It (486DX/33) does everything the fastest desk-top systems will do, and requires almost no concession on

your part. It's a great system, and an even better buy."

LAPTOP ISSUE (9/92)



TO ORDER CALL: 1-800-862-3099
In Canada: 1-214-702-0055
24 hr fax: 1-214-888-5743

All new prices!

NOTEBOOK	CPU	RAM (MBS)	BATT. LIFE (HRS)	HD (MBS)	PRICE
386SXL/25	386SXL-25 MHZ. OPTIONAL 80387SX	2	3.5+	80	\$1,399 \$52/mo*
386SL/25	INTEL 80386SL-25 MHZ, 64K CPU CACHE ADVANCED SL POWER MGMT.	2	3.5+	80	\$1,499 \$58/mo*
486SX/33	INTEL 80486SX-33 MHZ, 8K CPU CACHE	4	2.5+	80	\$1,999 \$74/mo*
486DX/33	INTEL 80486DX-33 MHZ, 8K CPU CACHE	4	2.5+	130	\$2,299 \$85/mo*

Ask About Our Corporate Credit & Volume Terms, Extended Warranty And Training!



COMPUDYNE

THE LOWEST OF THE LOW PRICES. GUARANTEED.

Business Hours (CDT):
Mon.-Fri. 7am-10pm:
Sat. 9am-5pm



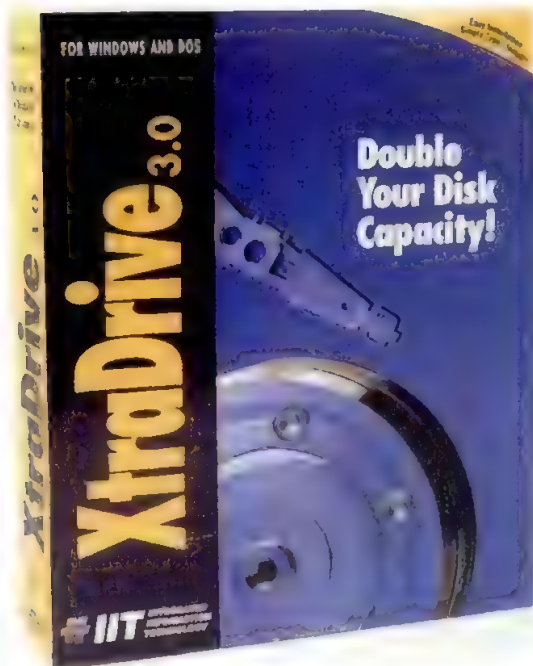
PCM0632

Magazine units courtesy of PC Computing, December 1992 pg. 78. ©1992 Ziff Communications Company. BYTE Magazine, September 1992. PC Sources, reprinted from PC Magazine, August 1992. (12/92) Reviews, August 1992. PC Magazine, reprinted from PC Magazine, August 1992. ©1992 Ziff Communications Company. PC World, reprinted from PC World, August 1992. All prices through United States Group, Inc. Excludes taxes. **Must be returned as new in original packaging. Prices and specifications subject to change without notice. ***Trade-in units belong to their registered owners. On-site service optional. All systems are shipped from the nearest Compudyne Superstore. Compudyne Direct, 15167 Business Ave. Dallas, TX 75244

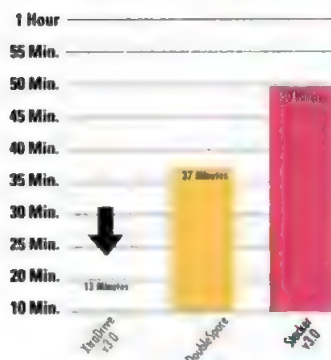
CIRCLE 144 ON READER SERVICE CARD

Double Your Disk Capacity SAFELY!

Compress files up to 8x on your PC, laptop & notebook!



Installation Time*



Only XtraDrive gives you quick installation and deinstallation. See for yourself

*Testing performed on a 386DX-40 MHz, 116 MB IDE Quantum HD with 110MB's of data, 8MB RAM (70ns), AMI BIOS, Symphony Chipset

The Safest Product in the Market!

Doubling your disk capacity with XtraDrive is quick, easy and, most importantly, SAFE! Other products caution you on the possible loss of data during installation. XtraDrive simply asks you to type INSTALL. Deinstallation is just as easy and safe. Other products like DOS 6.0 - DoubleSpace force you to reformat your hard drive entirely. With XtraDrive simply type DEINSTALL.

Works Transparently!

Unlike other products XtraDrive works behind the scenes at the BIOS level. Only XtraDrive can compress the DOS system and Windows swap files. And, only XtraDrive is compatible with Norton Utilities, PC Tools and every defragmentation program on the market.

Supports Removable Media!

XtraDrive supports removable media such as floppy disks, Bernoulli and Syquest drives, optical disks and more. And, unlike DOS 6.0 - DoubleSpace, XtraDrive allows you to read and write to your compressed floppy disk on computers where XtraDrive has not been installed. XtraDrive gives you flexibility!

Act Now!

Visit your computer store today for your copy of XtraDrive. XtraDrive not only gives you extra space, it gives you extra peace of mind!

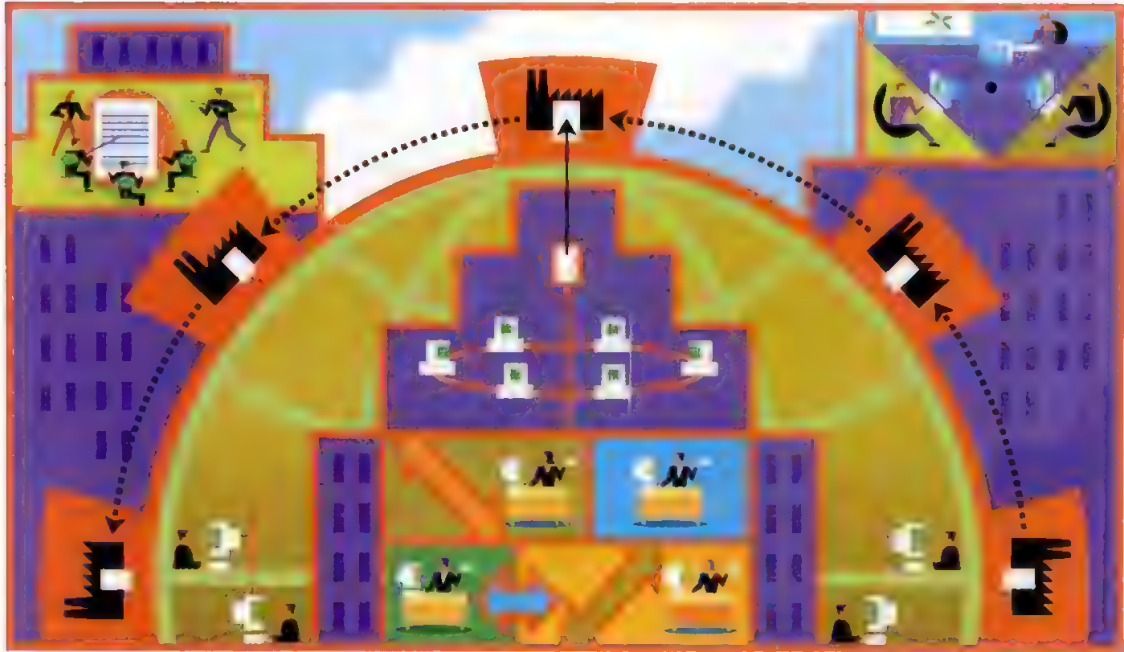
IIT INTEGRATED INFORMATION TECHNOLOGY

2445 Mission College Blvd., Santa Clara, CA 95054 Phone: 408-727-1885 (In Europe call 44 628 890 984)
©1993 Integrated Information Technology, Inc. XtraDrive is a trademark of Integrated Information Technology, Inc.
All other names are trademarks or registered trademarks of their respective companies.

CIRCLE 181 ON READER SERVICE CARD

BEST OF A NEW BREED

Groupware: Are We Ready?



Groupware. Everybody wants it, though no one's quite sure what it is. But the allure of software that can supercharge your group process is powerful. This report looks at the leaders of the PC groupware pack.

Practically the only point of agreement among pundits who discuss groupware (there are lots of them these days) is that it's tough to define. Attempts, such as "software that helps teams work productively together" and "not singleware," don't shed much light. In fact, *groupware* is never likely to have a much more precise meaning than *productivity application* does.

Is groupware real? Yes, it is. Are there intelligent

IN THIS REVIEW

<i>BeyondMail for DOS</i>	270
<i>BeyondMail for Windows</i>	270
<i>CM/1</i>	276
<i>Keyfile</i>	285
<i>Lotus Notes</i>	287
<i>Office.IQ</i>	291
<i>Futurus Team DOS/Windows Combo</i>	297

by Ted Stevenson

and useful things we can say about it? Yes, there are. But getting the message requires an open mind-set, a certain "willing suspension of disbelief." (Remember trying to explain to someone who had never seen a spreadsheet what an incredibly useful tool it was?) The bottom-line question is, of course, should your business consider taking the groupware "plunge"?

WHAT GROUP? WHY?

Fundamental to arriving at a clear answer is understanding the premise behind the groupware phenomenon: that today's successful business is one that knows how best to leverage the creative energies of workers loosely organized into ad hoc teams. Such teams tend to be related not in the old business model, as superior and subordinate, but as peers in a "flat" organizational structure. Furthermore, they may well be dispersed in different locations rather than gathered under one roof. Organizations that can nimbly create such workgroups to meet the quickly changing needs of today's business climate—and support them well—should have a competitive advantage.

The best way to get a handle on groupware, we decided, is to look at products. But, without a precise definition, which to choose? In the end, our selection criteria for the products we reviewed were loose—like the organization of a workgroup: currently shipping products that run on an Intel-compatible server with DOS and/or Windows clients that, at least to some degree, automate information sharing and/or the management of business processes. Several interesting products that didn't quite meet our criteria (weren't currently shipping, didn't run on Intel-based servers, or weren't in and of themselves groupware, but groupware enablers) we cover in sidebars.

THE E-MAIL CONNECTION

Local area networks—and the connections between them that make wide area networks—are the backbone of groupware. In turn, the software foundation of groupware is electronic mail—in simple terms, the transport of text messages across a LAN. While in our view e-mail isn't groupware per se, it is a vehicle for some communications facilities that do

have workgroup implications.

Let's chat. One of these is basic electronic conferencing, often referred to as "chat" capability. Products such as Futurus Team DOS/Windows Combo allow small groups to participate in simultaneous real-time keyboard conversations. (Microsoft Windows for Workgroups, Version 3.1, a workgroup-oriented operating environment, provides a similar capability.) The potential synergy arising from this kind of group interaction raises it, subtly but significantly, above the straight, linear communication process of mail. It's not going to revolutionize any company's strategic information management structure, but it can, in a small way, help tap the workgroup's creativity.

Let's meet. Another basic workgroup support tool often built into or around e-mail is scheduling. For better or worse, most organizations live by meetings, and anyone who's ever had to set one up knows how much time-gobbling drudgery is involved in reconciling all the conflicting personal schedules, finding a meeting place—and doing it all over again when a key participant backs out. If everybody's personal schedule is accessible over the LAN, however, the computer can handle much of the donkey work. Products such as WordPerfect Office 4.0 and, again, Futurus Team build scheduling into the fabric of their e-mail-centered systems. Microsoft Corp., similarly, provides its Schedule + module free with Microsoft Mail for PC Networks and Windows for Workgroups. (For a fuller discussion of this subject, see "Workgroup Scheduling: Have Your Computer Call My Computer," February 9, 1993.)

Let's not meet. Some recent academic studies have concluded that traditional meetings may not be the most efficient way of handling traditional business problems. One such research project at the University of Arizona led directly to the creation of Ventana Corp. and its commercial "virtual meeting" product, GroupSystems 5. VisionQuest, from Collaborative Technologies Corp., is another respected "meeting support" product.

The idea is that face-to-face meetings tend to be dominated by personalities, not ideas. Since ideas are what meeting organizers are presumably interested in, filtering out personalities, via structured

interactions over a computer network (whether or not the participants are actually in the same room), should promote a speedier and more productive result. Vendors' claims range from a conservative 30 percent reduction in meeting time to overall productivity improvements between 50 and 80 percent!

What products like these provide is methodology (what procedures will we use for gathering ideas? for discussing them? for reaching a consensus?) and structure (how do I rebut that item? reply to that person?). This is unquestionably full-blown groupware and, like most of the breed, requires that users buy into a philosophy—and willingly change their accustomed ways of doing things.

Let's decide. Closely related to virtual meeting packages are the various group decision tools. Like them, products such as CM/1 and Expert Choice offer both methodology and structure to facilitate the decision-making process. Operating in virtual time, they allow discussions to be carried out on an as-available basis by anyone on the network.

SAILING THE INFO SEAS

A very different kind of groupware focuses on managing (accessing, collecting, parsing, sorting, storing, distributing) information. Into this group falls Lotus Notes, a distributed database chameleon with built-in wide area connectivity, automated document routing, and personal e-mail. With these tools, users can easily build data-storage, data-tracking, and open discussion applications that can be connected via phone lines. A classic example (used in Lotus Notes advertising) is a corporate customer-support system, comprising routing of help requests, archives of previously handled problems and solutions, support-staff discussions and messages, and the like.

Beyond being a highly successful product, Lotus Notes is rapidly becoming the nucleus of a whole new groupware development community, as vendors develop Lotus Notes add-ons and products that work in concert with Lotus Notes.

FRUITFUL INFO SHARING

GrapeVINE—an Australian product only beginning to show up in North America—takes a very different ap-

Suitability to Task

PC Magazine's Suitability to Task ratings are designed for evaluating groups of products made to do the same thing—spreadsheets or tax preparation programs, for example. The products that fall under the groupware rubric are quite diverse—designed to do a wide variety of tasks that are loosely related at best. Identifying rigorous task categories for groupware, then, becomes a bit like trying to pin down categories for “personal productivity applications.”

Accordingly, to provide the broadest task-related insights about groupware products, we have chosen to present a loosely defined matrix matching each product against all the types of tasks subsumed under the category.

Rather than serving as “hard” purchase criteria, the ratings presented here are designed to give an overall feel for the shape of each product—strong in these areas, not so strong in those.

In considering groupware, it's especially important to keep in mind the general truth that a product's task-handling

ability is not exactly synonymous with its quality, value, or purpose.

Information sharing. The majority of our task categories fall under this heading. Clearly, collaborative work demands a free exchange of information and can benefit from efficient mechanisms for accessing and moving data.

E-mail is undoubtedly the most ubiquitous technology for moving messages and data files around among members of organizational workgroups; this ability is basic though not essential to groupware. A number of products seek to leverage the utility of basic transport systems by adding on capacities such as BBS or chat-style conferencing, shared contact or phone book databases, and the like.

Information management. The tools in this category are more focused on the organization and facilitation of work processes than on communication. They deal, for instance, with questions of where, why, and how work gets done. They also look at who creates the work or projects, where the documents reside, how far along the process is, where a certain file or message and its attached files are in the process at this moment, and so on.

1—Surted to the task 2—Exceptionally well suited to the task. N/A—Not applicable. The product does not perform this task.	BeyondMail for DOS, BeyondMail for Windows	CM/1	Futurus Team DOS/ Windows Combo	Keyfile	Lotus Notes	Microsoft Windows for Workgroups	Office.ID	TeamLinks for Windows
Information Sharing								
Messaging (e-mail)	2	1	2	1	1	2	1	1
File transport	2	N/A	1	2	2	2	1	2
Group faxing	1	N/A	2	1	2*	N/A	1	N/A
WAN connections	1*	N/A	1*	1	2	N/A	N/A	1*
Workgroup scheduling	N/A	N/A	2	N/A	N/A	2	N/A	N/A
BBS-style discussion	N/A	2	N/A	N/A	2	N/A	N/A	N/A
Real-time chat	N/A	1	1	N/A	N/A	2	N/A	N/A
Structured-meeting support	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Decision support	N/A	2	N/A	N/A	N/A	1	N/A	N/A
Shared contact database	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A
Shared information database	N/A	N/A	N/A	1	2	N/A	N/A	N/A
Collaborative documents	N/A	N/A	N/A	2	2	1	2	N/A
Information Management								
Access control (security)	1	1	1	1	2	N/A	2	1
Data search and retrieval	2	1	N/A	1	1	N/A	1	N/A
Archiving	2	N/A	1	2	N/A	N/A	N/A	N/A
Forms routing and tracking	2	N/A	1	1	2	N/A	2	2
Task routing and tracking	2	N/A	N/A	1	N/A	N/A	2	N/A
Forms creation	2**	N/A	N/A	1	2	N/A	N/A	1
Report creation	N/A	N/A	N/A	1	1	N/A	1	1

* With optional gateway

** With optional forms designer

proach to the issue of group information needs. First, GrapeVINE must be specially tooled for each organization. In the setup process (which requires considerable effort and expertise), topics of interest are identified for each person on the system and classified by interest levels. A complex thesaurus is built to link keywords to topics. GrapeVINE then parses incoming information (which can come from a large number of sources) and routes it to the appropriate persons.

But this is only step one. When recipients read their in-box material, they can perform a much more intelligent evaluation, commenting, reclassifying, and re-routing items as appropriate. Thus a basically automatic information-distribution system efficiently leverages the expertise of individuals for the overall benefit of the organization.

A similar (if less sophisticated) approach to moving information is found in BeyondMail, a rules-based e-mail package offered by Beyond Inc. BeyondMail users can build fairly complex schemes for routing incoming messages to special folders or to other users, based on attributes of the header or message. When rules are used with Beyond's optional forms-building tool, complex work-flow processes can also be designed.

GOING WITH THE FLOW

Work-flow automation software can (and should) do more than move forms around a network, however. Portfolio Technologies' Office.IQ organizes projects into "packages" that contain pointers for all the pertinent data files ("documents") and the applications in which they were created, so that all the tools necessary for completing a task are bundled together.

Another important piece of the work-flow automation picture is the tools and methodologies for building the work-flow "templates" themselves. The pick-list programming found in Keyfile Corp.'s Keyfile (reviewed here) is a good example. Predefined connections be-

tween events ("wait for documents," "job done") structure the total task as it moves from workstation to workstation. Keyfile provides enough flexibility in the system that users along the way can modify and refine the process as it progresses.

Moreover, a good work-flow product (Office.IQ, for example) provides progress tracking, so the person overseeing the process can always pinpoint a project's current status and location.

Work flow is not inherently a standalone "application" or function. It can be an ingredient in many other kinds of software tools. (In fact, none of the examples we've discussed here are exclusively devoted to work-flow logistics.) Among the developers working on work-flow systems, Action Technologies (developers of the MHS e-mail transport system) probably has the most experience.

Action has been working behind the scenes for years as an OEM technology supplier, evolving methodologies for work-flow design and tools for industrial-strength work-flow management. The Action Workflow System—comprising the Analyst, a "process engineering" tool, the Application Builder, which turns analyses into work-flow structures, and other tools—is a complete work-flow engine that will be licensed to vendors including DaVinci, LaserData, Lotus, and Verimation. Applications using Action's technology should be available by the end of the second quarter.

LOOKING AHEAD

Today, groupware stands somewhere between infancy and early childhood. Viable products are here, but businesses are only beginning to embrace them. Small wonder; the products that do exist are a wildly divergent bunch—in their functions, complexity, and cost.

At one end of the scale, a product like Futurus Team offers communications with a workgroup twist at an affordable price (\$649 for five users) and minimal setup and administrative demands. At

the other end, industrial-strength products, such as CM/1 and Keyfile, can cost tens of thousands of dollars to implement, often requiring the services of VARs or other experts for setup and training.

Cost aside, the *right* groupware product might just be the catalyst that kicks your business into overdrive. Peruse the Suitability to Task matrix and reviews that follow for a survey of the landscape.

Beyond Inc.

BeyondMail for DOS

BeyondMail for Windows

BY RON ANDERSON

BeyondMail (for DOS, Release 1.1, and for Windows, Release 1.0), from Beyond, isn't the only PC e-mail package with pretensions to groupware status, but it is the



only one clearly worthy of the designation. BeyondMail, available for MHS or VINES networks, certainly provides DOS and Microsoft Windows users with robust e-mail, but

(as the name suggests) it goes significantly further. The *beyond* part of BeyondMail represents end user programming. Mail administrators and end users alike can instruct this mail program to deal with or initiate communications to and from coworkers automatically. At \$995 for ten users, you have never been able to hire such good help so cheaply.

BeyondMail is a state-of-the-art forms-based e-mail package that holds its own even if you ignore its unique programmability. Virtually any feature you can imagine needing for creating, storing, and replying to messages is included in this package. Memo, Phone Message, Request, Meeting, Customer Support, and Transmittal Memo forms are the standard offerings. With the optional BeyondMail Forms Designer package (\$995), you can create any additional forms you may need.

The DOS client utilizes drop-down menus, check boxes, and combo boxes to guide users through form completion.

Our Contributors: TED STEVENSON is an associate editor of *PC Magazine*. LANCE ULANOFF is a staff editor of *PC Magazine*. CRAIG STINSON is a contributing editor to *PC Magazine*. BEN Z. GOTTESMAN is a project leader at PC Magazine Labs. TONY POMPILI is an information systems manager with Ziff-Davis Publishing Company. RON ANDERSON, STEVEN C. M. CHEN, JAMES KARNEY, and GREG PASTRICK are frequent contributors to *PC Magazine*.



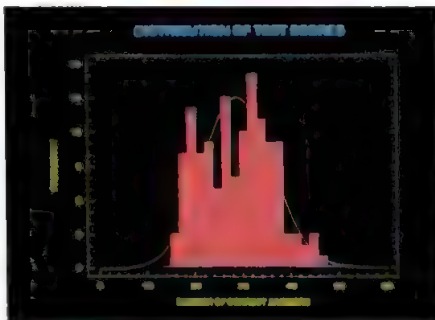
STATGRAPHICS *Plus*. For People Who Made It Through Statistics With Their Eyes Closed.

Whether you aced statistics in your sleep, or just plain slept, you'll find STATGRAPHICS *Plus* is a software dream come true: more than 250 menu-driven procedures, eye-popping graphics, and full support for the power and capacity of your 386/486 PC. No wonder *Software Digest* rated us number one for ease of use and learning.

How easy? This easy.

No matter how much—or how little—you know about statistics, STATGRAPHICS *Plus* does the work for you. Calculating precisely the solutions you need, from sales forecasts to assembly-line analyses to cancer research studies. And then displaying the results in stunning graphics that let you *see* the answer. With simple, point-and-click menus

and a powerful graphics editor that makes generating presentation-quality results a cinch.



What you don't know, STATGRAPHICS *Plus* does.

Even if you've forgotten some—or all—of your statistics, STATGRAPHICS *Plus* remembers: Regression analysis. ANOVA. Quality control. Experimental

design. Multivariate and time series procedures. Lifetime data analysis. And compatibility with your existing database, spreadsheet, and ASCII files. There's much, much more, too, including award-winning documentation, on-line help and telephone support.

But seeing is believing: call us today for more information. And witness the power of STATGRAPHICS *Plus* with your own eyes. It's the perfect tool for people who know their statistics. And for people who don't.

STATGRAPHICS® *Plus*

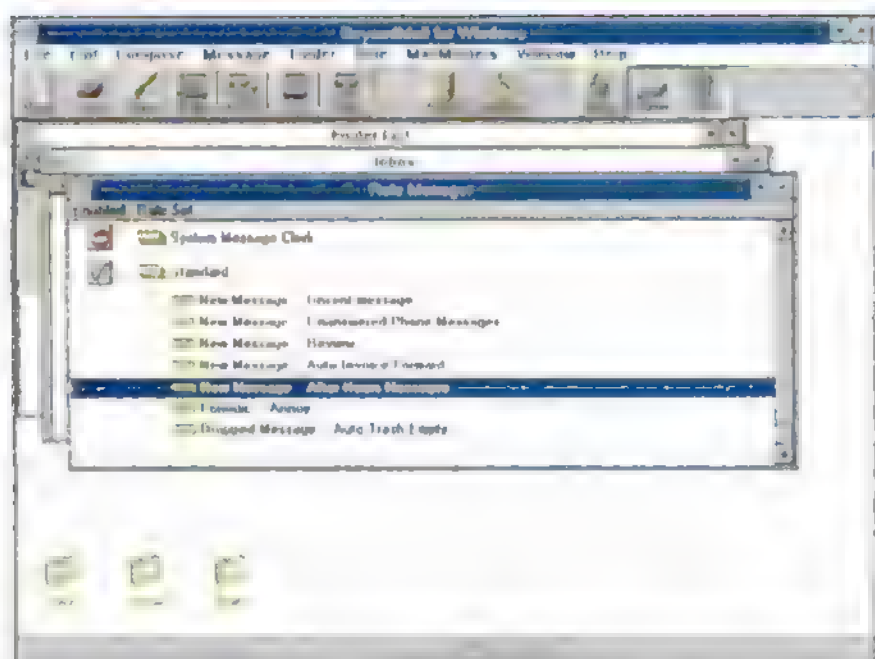
In Maryland, 301-984-5123.

Outside the U.S., 301-984-5412.

CIRCLE 365 ON READER SERVICE CARD

(800) 592-0050, Ext.200

Manugistics, Inc., 2115 East Jefferson St., Rockville, MD 20852. STATGRAPHICS is a registered trademark of Statistical Graphics Corporation. Evaluation © Software Digest Ratings Report, Vol. 8, No. 5 issue covering statistics programs. STATGRAPHICS *Plus* runs on 386, 386SX, and 486 computers with at least 4 MB of RAM and a graphics card. Version for 286/640K machines also available. © 1993 Manugistics, Inc. Authorized international dealers: Australia (03) 866 1766, United Kingdom (0753) 831 451, France (01) 45-27-20-61, Germany (069) 80053-0/(0212) 339099, Italy (02) 29404830, Spain (01) 341.535.0125, Sweden (0) 31 776 01 21, Netherlands (03402) 66336.



BeyondMail's Rule Manager makes it easy to keep track of the automatic actions BeyondMail is performing.

The Windows client takes full advantage of the Windows 3.1 environment with drag-and-drop, Object Linking and Embedding (OLE), and Dynamic Data Exchange (DDE). OLE and DDE support are provided in both client and server modes. DDE is accessible through BeyondRules, BeyondMail's end user programming language. Programmable DDE enables you to extend the capabilities of BeyondMail into Windows spreadsheets, databases, and word processors. BeyondRules provides you with the capability to create turnkey solutions for your business information needs.

RULES TO LIVE BY

Beyond's commitment to providing quality end user tools to manage messages is clear. The user guide illustrates rules creation and usage in every chapter. To help users get their feet wet, Beyond provides MailMinders, easy-to-use rules-based utilities that serve as entry-level experiences with BeyondRules.

Four types of MailMinders are available: the Message Clerk, AutoTickle, AutoForward, and While I'm Out. On the basis of criteria you specify by filling in a form, the Message Clerk automatically files messages in various folders when they arrive. If you want to inform a colleague every time you get budget information from someone in accounting, AutoForward will take care of this for you. When you're out of the office for a few hours or days, While I'm Out can automatically reply to mail messages or forward important phone messages to a co-worker.

Ticklers serve as reminders for time-critical events. If a message from your boss prompts you to turn in that special report in two weeks, but you don't need to start working on it until two days before it's due, you would like to be reminded again in 12 days. AutoTickle will move the message to the Ticker folder and, at the appointed time, remind you that your report is due. Once you are familiar with MailMinders, the progression to using the Rule Editor to create your own rules is linear.

ROLLING YOUR OWN

Like MailMinders, the Rule Editor is forms based. Rules are phrased using a WHEN-IF-THEN structure and created by filling in a rule form. The WHEN and IF sections of a rule make generous use of drop-down list boxes to help you define the various events that trigger the rule. The THEN action is more complex, but BeyondMail gives you plenty of help with the numerous actions and functions available, including the ability to paste them into the rule form from a list.

To further illustrate BeyondMail's work-flow management capabilities, let's

create a hypothetical purchase request system. This company's business rules state that middle managers can approve purchases up to \$1,000, but department heads must approve any orders over \$1,000. First, the mail administrator creates a customized purchase request form that automatically calculates extended prices and request totals.

GLOBAL RULE

The House Rule (Beyond's name for a global rule) used to route purchase requests to the appropriate approval authority is created next. The rule includes the following statements: WHEN a purchase request is generated, IF the COMPLETE check box is true, THEN IF TOTAL is less than or equal to \$1,000 SEND to variable MIDDLEMAN, MOVE to INVOICE folder, and produce an ALERT dialog; ELSE SEND to variable DEPARTMENT_HEAD, MOVE to INVOICE folder, and produce an ALERT dialog.

Another rule will forward the approved request to accounting and alert the originator when the purchase is approved. A third rule notifies the originator if the order is not acted on within a week. Additional rules could automate procedures in accounting—including DDE links to a Windows accounting package—and in shipping and receiving.

SYSTEM OVERHEAD

Because BeyondMail is so customizable, administering the system may be more involved than with many competing products. BeyondMail comes with a nice set of tools to help you with administrative tasks, including a fairly straightforward installation routine. A medium-size company that is actively building work-flow applications will probably need to dedicate at least one person to administering the mail system and writing House Rules.

Compared with other e-mail offerings, BeyondMail carries a somewhat higher price as the user count increases. While other LAN packages tend to decrease the cost per user as you purchase more licenses, BeyondMail stays pretty close to the \$95 per user cost whether you purchase the 10-user or the 100-user configuration.

▶ FACT FILE

**BeyondMail for DOS,
Release 1.1**

**BeyondMail for Windows,
Release 1.0**

*Beyond Inc., 38 Sidney St., Cambridge, MA
02139; 800-845-8511, 617-621-0095;
fax, 617-621-0096*

List price: For 10 users, \$995; for 20 users, \$1,995, for 100 users, \$9,500.

Requires: Server. No RAM. Workstation: 1MB RAM. For DOS version: 2.5MB hard disk space, DOS 3.1 or later. For Windows version: 5MB hard disk space, Microsoft Windows 3.x

In short: While Beyond's form-based mail system is excellent when considered on its own, its use of rules-based technology is what makes it truly innovative and exciting


ON READER SERVICE CARD

THE GAME IS ETHERNET



AND WE'RE DEALING THE CARDS.

With your network as the stakes, you don't want to play fast and loose with adapters. Not when you could be holding full-featured, quality Thomas-Conrad cards. At a price that's a sweetheart deal.

You can bet we've got all the features you want. In fact, we've upped the ante - with things like menu-driven software configuration, so even novices can plug and play. And support for NE2000 and WD modes, which gets you into any popular network game, including NetWare® and LAN Manager.

The real name of the Ethernet® game, though, is reliability and support - Thomas-Conrad strong suits. We staff our tech support center 24 hours-a-day, 7 days-a-week with old hands at figuring out network problems.

Now's the time to wheel and deal with your Thomas-Conrad reseller. Compare high-roller prices on face cards from Intel®, 3Com® and SMC®, and you'll agree: Thomas-Conrad has one *wild* Ethernet card.

800-332-8683

THOMAS • CONRAD

TC5143
ETHERNET
ADAPTER

SOFTWARE-CONFIGURABLE

BUSSET
THICK/THIN
ETHERNET
MEDIA

NE
AND
MODE

SOCKET FOR OPTIONAL BOOT ROM

FOUR DIAGNOSTIC LEDS

MTBF > 100 YEARS

TECH

24
HOURS

SUPPORT

MADE IN
AMERICA
QUALITY

CIRCLE 330 ON READER SERVICE CARD

VOL. 7
NO. 5

Ziff NET NEWS

Over 100,000 interested computer users rely on ZiffNet for virtually anything that has to do with computing. It's all here — thousands of the best downloadable shareware and freeware titles, including the world-famous *PC Magazine* utilities...late-breaking industry news...computer buying information...interactive industry forums...technical support ...and more — all available **online!**

This Month's Hot Software Downloads

TITLE	FILENAME	DESCRIPTION	LOCATION
ZIPKEY ZIPCODE DATABASE	ZIPKEY.ZIP	A look-up program for zip codes, city names, and states with data on 43,000+ zip codes.	PBSAPPS Lib 9 Business/ Finance
MINES (FOR WINDOWS)	WNMINE.ZIP	Get to the bottom of the screen without getting blown up. Good solitaire logic game. Requires Windows 3.0.	PBSARC Lib 4 Windows Games
DRAFT CHOICE	DRAFTC.ZIP	The easiest amateur CAD system around. Has line, box, freehand drawing, rubber band, scale, rotate, mirror, explode, trim, undo, linear and circular arrays.	PBSAPPS Lib 8 Graphics
WINZIP	WINZIP.ZIP	ZIP file manager that can operate almost all of PKZIP/PKUNZIP's functions, plus LZH and ARC files. Requires Windows 3.0.	PBSAPPS Lib 4 Windows Utilities
CHECKERS (FOR WINDOWS)	WNCHEC.ZIP	For 2 players, or play against the computer. 5 skill levels. A solid game without frills. Requires Windows 3.0.	PBSARC Lib 4 Windows Games
1993 Baseball Schedule	MLSCHD.ZIP	The complete 1993 Major League Baseball Schedule, in dBase, Microsoft Excel, and text format.	AFTERHOURS Forum Lib 6 "Sports of all Sorts"
COOPER PCX PICTURES	PCXCP1.ZIP PCXCP2.ZIP PCXCP3.ZIP	128 .PCX pictures of cute animal and people cartoons for greeting cards, school newsletters, and similar material.	PBSAPPS Lib 8 Graphics
ABOVE AND BEYOND	ABVBND.ZIP	Personal Information Manager with alarm, calendar, text editor, dialer, scheduler and appointment book. Requires Windows 3.x.	PBSAPPS Lib 5 Desktop Tools
ROADWAYS PC	RDWAYS.ZIP	Trip planning program shows highway numbers, major cities, distances, times and calculates trip costs. Requires 384k.	PBSAPPS Lib 5 Desktop Tools
QEDIT	QEDIT.ZIP	Fast text editor with huge feature set — macros, columnar editing, box drawing, 43-line EGA and 50-line VGA support.	PBSAPPS Lib 6 DOS Applications

**There are thousands more top-rated programs to choose from.
Just type GO ZNT:SOFTLIB for a complete listing.**

**We're Having
A Meeting Of
Industry
Insiders...
You're Invited.**



Here's your chance to tell the computing industry's movers and shakers what you really think about their products. As a ZiffNet member, you'll connect with product experts, Ziff editors and other knowledgeable users like yourself in our interactive forums. Drop by our Executives Online forum, for example, and discuss product issues and trends with industry leaders like **Gordon Eubanks**, Mike Maples and Ted Waitt — frequent guests on ZiffNet. You'll also find in-depth information on just-released products, plus demos of the hottest new applications. To see what's in store, type GO ZNT:CALENDAR.

Get More Out Of Your Favorite Ziff Magazines... Online!

ZiffNet gives you direct access to the archives of Ziff magazine product reviews, buying guides, tips and tricks, and more. You'll also have in-depth information **linked to the current printed issues**, so you can dig deeper into topics of interest.

For example, when you see a new product reviewed in a First Look story, you can log on to ZiffNet and discuss it with the lab analysts, ask questions related to your own specific requirements — even download a demo of the product! You can also speak directly to Ziff editors and columnists like John Dvorak and Bill Machrone to get their opinions and insights. All you have to do is type GO ZNT:MAGAZINE. This kind of access to information and industry experts simply isn't available **anywhere else.**



READ IT, RESEARCH IT, DOWNLOAD IT, DISCOVER IT ONLINE, ON ZIFFNET.

NEW
MEMBER
SPECIAL

Computer Manuals Gather Dust As Online Technical Support Gathers Steam.



What do you do when you get the error message "SETUP ERROR #6020" while running the Windows™ 3.1 setup? Or discover that upgrading to DOS 5.0 has changed the fonts available in Windows Enhanced Mode? It could take hours to find the answer by poring over your manuals. But ZiffNet's one-of-a-kind Support On Site database gives you the answer **right away**. Here is the world's largest, most authoritative source of tech notes and other data on all major applications from leading hardware and software companies — Microsoft®, Borland®, WordPerfect®, IBM®, Hewlett-Packard® and more — all organized in one convenient retrieval program. There's no easier way to get more out of the hardware and software you already own. Type GO ZNT:ONSITE.

Get The Inside Scoop On The Industry The Same Way Industry Leaders Do.



What will computer industry insiders be talking about next week? Find out on ZiffNet! You'll get weekly news summaries from *PC Week* and *MacWEEK* — controlled circulation publications — not available on any newsstand. But with ZiffNet, industry news, market trends, even inside information from Spencer Katt are all delivered right to your PC the Friday night **before** they're published. There's also *NewsBytes*, the award-winning international daily newswire to keep you right up to the minute on late-breaking developments.

Are You Really Making The Right Buying Decision?



Before you spend a dime on a system, printer, monitor or software, check out ZiffNet's Buying Advice. Here in one place you'll have access to the information you need to make a smart decision — objective information drawn from dozens of sources. ZiffNet guides you through the whole buying process — identifying the right products, evaluating them, and shopping for the best values. Search through reviews drawn from Ziff

magazines...check out the product's ratings and awards...research compatibility issues...even query Ziff Buyers' Market for the latest direct-to-you prices. Best of all, you can ask Ziff experts, editors and other users for their opinions **before you buy**.

New Members To Receive Free Software Download!

Enroll online now, and receive a FREE download of "Windows Tips and Tricks," plus the complete ZiffNet Membership Kit, with maps of the service, the *Greatest Hits Software Collection* and your first issue of *Threads*, the ZiffNet newsletter. **See details below.**

LOG ON TO ZiffNET AND GET A FREE SOFTWARE DOWNLOAD. HERE'S HOW:

Enroll in ZiffNet now and get a free download of "Windows Tips and Tricks," featuring nearly 100 valuable ideas and shortcuts for Windows, plus a free membership kit. Here's how to enroll:

COMPUSEVER® MEMBERS — type GO ZIFFNET TO SIGN ON DIRECT TO ZIFFNET —

1. From any modem, set your communications software to 7 data bits, even parity, 1 stop bit. Select a data transfer rate (bits per second) of 1200, 2400 or 9600. Have your modem call the local ZiffNet number.*
2. Respond to the prompts with the information below:
When you connect: <Ctrl C> PC User Password: ZIFF*NET
Host Name: CIS Enter Agreement Number: ZAD2
User ID: 177000.5555 Register Name & Credit Card #
3. Now you'll receive your temporary User ID & Password. You will receive a permanent password by mail within 10 days
* Find your local ZiffNet number:
By modem, dial 800-346-3247, at user ID prompt type PHONES
By voice, dial 800-635-6225

TO GET YOUR FREE COPY OF "WINDOWS TIPS AND TRICKS":
Type "GO GIFT" after enrollment.

NEW! Some of these services are now available on ZiffNet for PRODIGY PRODIGY® members [JUMP*]: ziffnet for full details.

ZiffNet membership fee is just \$2.50 a month. Standard connect-time charges apply for certain services like downloading software: \$12.80/hour at 1200 and 2400 baud; \$22.80/hour at 9600 baud. Rates are fully explained online.

Every company has different information flow needs—and so does every individual—and requires information to flow in unique ways between workgroups and individuals. A one-size-fits-all approach to this inherent diversity and the changing requirements present in corporations can limit the usefulness of the tools used to automate work flow. The key to BeyondMail's power and potential is the ability to customize how information flow is handled, clear down to the level of the end user. If you're looking for a simple work-flow management application that empowers both administrators and end users, BeyondMail may give you all you need.

Corporate Memory Systems Inc.

CM/1

BY BEN Z. GOTTESMAN

Electronic mail programs have allowed users to escape from the confines of face-to-face meetings. Users don't need to physically gather at the same time and place in order to discuss important topics. Unfortunately, the linear and ephemeral nature of e-mail makes it less than ideal for working out complex, multifaceted problems. But Corporate Memory Systems Inc. (CMSI) has developed CM/1, Version 1.0, a Windows-based hypertext

tool to help with such problems.

CM/1 is based on the problem-solving methodology known as the Issue-Based Information System (IBIS). In IBIS, problems are explored using Issues, Positions, and Arguments. The highly structured nature of the components keeps the "conversation" focused and helps overcome the dilemma of too many arguments and too much information to keep track of.

CM/1 adds to IBIS a graphic representation of the conversation in which the relationship of each piece to the total picture becomes clearly visible. Discussions created in CM/1 can be saved and reused to prevent repeating prior mistakes or duplicating work.

To begin a discussion, you create a

Map View labeled with the title of the discussion, such as "Sales Automation," "Product Marketing," or "Quality Assurance." Within the map, you create an Issue node. In order to promote discussion, Issues are open-ended questions such as "How should we increase market awareness?" as opposed to far more particular questions such as "Should we advertise on television to increase awareness?"

Participants then offer possible solutions in the form of Position nodes. (To create a node, you simply type the first letter of the node type, such as *P* for *Position*, and type the label. After the node is created, click the right mouse button and drag the cursor from the Position to the Issue to create a "Responds To" link.) Arguments are added in a similar fashion. An Argument node can Support or Object To a Position, or it can Specialize (further explain or refine) an Argument. New Issues may be raised that expand or challenge previous Issues, Positions, or Arguments. Type a letter, type a label, and drag the cursor; once you've mastered that, you're well on your way to mastering CM/1.



CM/1 encourages in-depth analysis of issues. Unread messages are indicated in red.

The graphical discussion tree you create with CM/1 allows far more in-depth discussion than the electronic mail's linear format. At any time, you can add a new Issue, Position, or Argument to any previous node, regardless of whether the original node was entered yesterday or two months prior. Other participants can immediately spot added nodes because their text appears in red to indicate the nodes have not yet been read. And by observing the connections and pointers between these and other nodes, users are quickly reminded of the earlier discussions to which the new nodes respond. Try that in your electronic mail program.

When you open up a Map View, you will see as many nodes as can fit in the window. The higher the resolution you run Windows in, the more of the discussion you will be able to see at a glance. In the lower-left-hand corner is a miniaturized Full Map view. This lets you quickly see *all* the branches that have been spawned from the Issue. To zoom in on portions of the map, you can drag an outline box representing the screen within the Full Map view. Unfortunately, the program does not have scroll bars to move around the map. CMSI has indicated that they will be added in an upcoming release.

IN-DEPTH DISCUSSION

In addition to Issue, Position, and Argument nodes, CM/1 also supports Reference, Notes, and Decision nodes. Reference nodes allow links to external documents—a spreadsheet that backs up your Argument, for example. Reference

FACT FILE

CM/1, Version 1.0

Corporate Memory Systems Inc.,
8920 Business Park Dr., Austin, TX 78759;
512-795-9999; fax, 512-794-5921

List price: For 1 user, \$1,500; for 200 users, \$780

Requires: Server: 1.5MB hard disk space Novell's NetWare recommended Workstation 4MB RAM, any DOS-based network, Microsoft Windows 3.0 or later Super VGA recommended.

In short: Corporate Memory Systems' CM/1, Version 1.0, provides organizations with a means of capturing the group thought processes that lead up to decisions. CM/1 is especially suited for complex decision-making and long-ranging discussions. By combining graphics and hypertext, it breaks out of the linear, chronological model of electronic mail. Its easy-to-use interface encourages thorough exploration of issues.

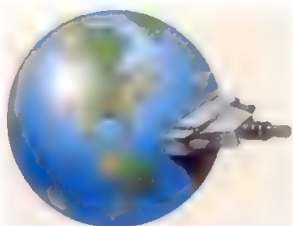


ON READER SERVICE CARD

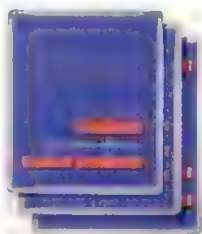
Smartcom For Windows.

We Worked Longer And Smarter To Make It Easier and Faster!

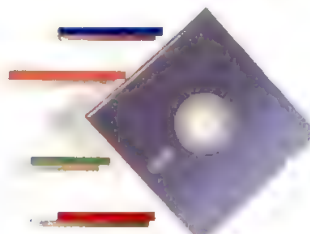
\$49 Limited Time Offer



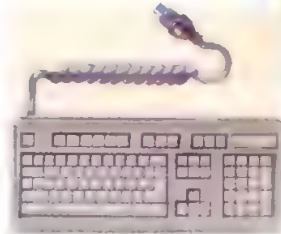
Connect to PCs, Macintoshes®, DEC Vax, Minilab, DataView, or almost anything else



The Editor creates documents with color, ANSI graphics and more



Send and receive files with speed and confidence



Assign edit and program actions, macros, scripts to keys for easy access



Connect to your favorite online service with a keystroke or a click



Available in five languages, Smartcom can be your international standard



Easy enough for novices, sophisticated enough for experts



Accessing E-Mail and editing messages is easy



Automate communications and create custom programs with SCOPE scripting language



Download and view .GIF images, even create slide shows



Supports Hayes ESP accelerator for faster Windows communications



User-defined Smart Buttons do your work for you - just click!

Finally, communications software that lets you run Windows™ the way you had hoped - easily and quickly. Turn it on and this powerhouse automatically configures the modem, sets the speed, and gets you communicating right out of the box. With Smartcom™ for Windows, you're always getting constant, easy to understand visual feedback on call status and file transfers. *Computer User* says Smartcom "fills a gaping hole in the Windows world."

Since Smartcom for Windows is easier to use, you'll be a speed demon on the job. Our powerful SCOPE scripting automates repetitive tasks to save you time and money with on-line services and mainframe connections. It even has a Learn option that records your keystrokes to



automatically create button driven scripts for accessing E-mail, printing, customizing - just about anything. According to *Windows User*, "performance will never be a worry."

With Smartcom for Windows 5 language options, you can finally set the standard for global communications too. It can be used with high-speed modems, ISDN, LANs, Hayes® ESP™ Communications Accelerator, and NetBIOS or TCP/IP internetworking.

For more information on the communications software that *Windows User* called "absolutely brilliant," phone 1-800-93-HAYES. In Canada, call 1-800-665-1259. Make it easy. Make it fast. Make it Smartcom for Windows.



Why settle for anything less? Hayes products have the computer world talking. More than ever.

Go Online with Hayes BBS; call 800-874-2937 or 404-446-6336.

©Copyright 1993 Hayes Microcomputer Products, Inc., P.O. Box 106203, Atlanta, GA 30348. Hayes, the Hayes logo and ESP are registered trademarks and Smartcom is a trademark of Hayes Microcomputer Products, Inc. Other trademarks mentioned are trademarks of their respective companies.

CIRCLE 120 ON READER SERVICE CARD

■ Which Group(ware) Are You?

We looked at nine products, and we found almost as many different types of work-group situations. If groupware is a pie, then each product tackles a single slice. Of course, there's a certain degree of overlap, and not all pieces are equal. Here's a look at the slices and the products that best fit them.

THE SMALL GROUP

Keyfile, Version 2.0
Office.IQ

This is a group of four or five tightly knit coworkers who tend to interact heavily on projects. (The groups are not necessarily everlasting; they may dissolve and be re-created on a per-project basis.) One member may cre-

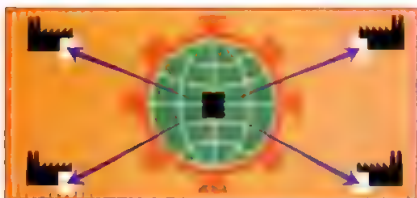


ate, copy, or scan an initial set of files or documents. The other team members enhance, adjust, suggest changes to, and generally refocus the work. All collaborative notes can appear on one document; the document can have some tracking provision to log whose changes came first, second, third, and so forth. These comments and changes can then be incorporated into the finished project.

THE PLANETARY GROUP

Lotus Notes, Release 2.1A

With offices all over the world, a company can have a hard time keeping track of all its wide-reaching information. For example, salespeople in every location need to know whether the account for the Boolex Company, with offices in America and Canada, shows that it has agreed to buy widgets for all



its locations. A self-replicating database with some application development tools could be the perfect answer. With it, up-to-date customer and account histories would be available at all locations, and with a sales-order tracking tool built in the application development environment, all invoices are automatically filled and copied to the product distribution center.

THE DECISION-MAKING GROUP

CM/I, Version 1.0

OPEC oil ministers regularly meet to decide whether they should slow production to hike up oil prices. The problem is, they always have to meet face to face and discuss the same issues over and over again—every year.

What they need is a tool that will let them discuss the issues involved

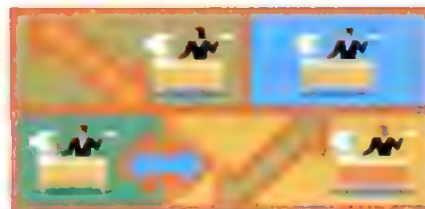


from their individual locations (over a proprietary leased-line network) and yet remember past discussions, arguments, and conclusions to save time.

THE WORN-SNEAKERS GROUP

BeyondMail for DOS, Release 1.1
BeyondMail for Windows, Release 1.0
Futurus Team DOS/Windows Combo
TeamLinks for Windows, Version 1.1
WordPerfect Office 4.0

The workers in a small business environment are constantly hand delivering the goods: products, invoices, messages, and even appointment notices from one desk to another for approval



and changes. And to make matters worse, they can't afford secretaries. So when they're out of the office, work just piles up on their desks; nothing moves. They need to automate the flow of work and messaging from one desk to another (in their absence and while they're at work) in a logical way that can be saved and changed as necessary. And frankly, they need to cut back on a few messenger people who run up and down between floors.

THE "WHY DO WE NEED A SERVER?" GROUP

Microsoft Windows for Workgroups, Version 3.1

Workers in situations like this have something in common with the Small Group and the Worn-Sneakers Group, but they don't want the expense, rigidity, and maintenance of a server-based file system. For small groups that work closely together, one solution is to create ad hoc peer-to-peer relationships.



These folks just want to perform some scheduling, send some e-mail, and have the ability to log electronically on to each other's hard disk and copy or work on the files they need to.

—Lance Ulanoff

IBM

"As the next wave of technology rolls in, we'll help you ride it."

IBM PCs and IBM people help make it easier to choose a computer for today — and tomorrow.

In fact, tomorrow is just around the corner. It's the brave new world of processing called Pentium™.

These newest IBM PS/ValuePoint™ PCs are upgradable to an Intel® OverDrive™ processor that will be based on Pentium™ technology. So when you're ready to take this big next step, these PCs — along with the

personal computing experts at IBM PC Direct™ — will help you take it in stride.

PS/ValuePoint systems are available in more than 20,000 configurations: as standalones, servers or medialess clients. Call us and we can customize one for you using many of today's most popular options.

Also new and standard: faster local bus video, larger and faster hard drives, upgradable memory to 64MB and easier processor upgradability.



PS/ValuePoint 425SX/S

\$1,579*

NEW!

IBM Credit Lease \$57/mo.**

4MB RAM, IBM DOS and Microsoft® Windows™ preinstalled

Fast!

- i486™ SX/25MHz processor
- 8KB internal cache
- High Performance SVGA VESA Local Bus Video with 1MB DRAM

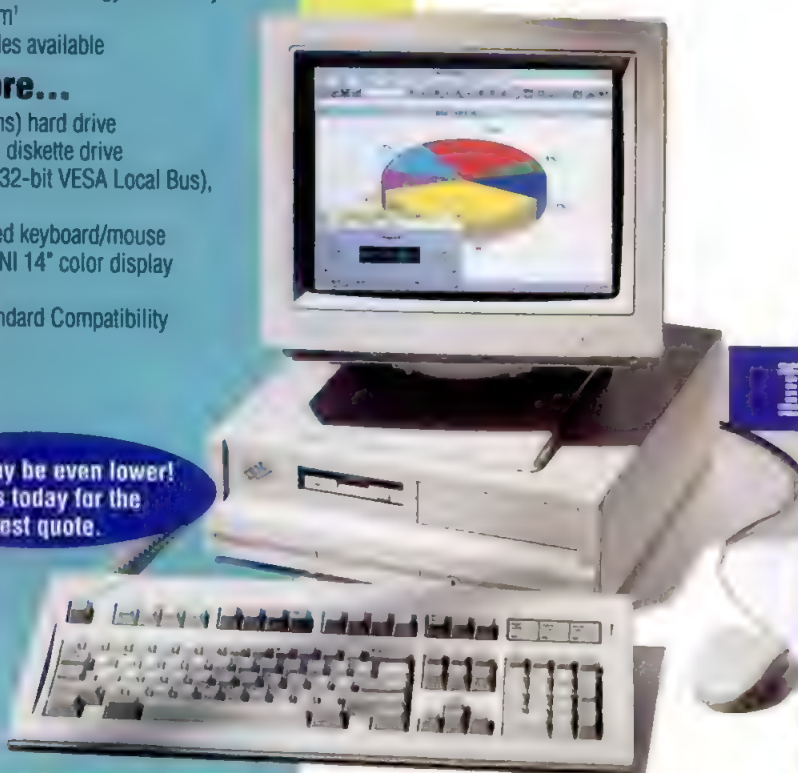
Easy Upgrades!

- Expanded processor upgradability via Intel OverDrive technology all the way up to Pentium!
- RAM upgrades available

And More...

- 120MB (15ms) hard drive
- 3.5" 1.44MB diskette drive
- 3 slots (one 32-bit VESA Local Bus), 3 bays
- IBM enhanced keyboard/mouse
- 6312 SVGA NI 14" color display
- Networkable
- Industry Standard Compatibility

Prices may be even lower!
Call us today for the latest quote.



IBM PC Direct

We're putting the personal in personal computing.

Call
1 800 IBM-2YOU

1 800 426-2968, refer to: X613PCM1
8am-midnight M-F, EDT; 8am-7pm Sat., EDT.



Purchase order is available for qualifying customers.

IBM

PS/ValuePoint 466DX2/T

\$3,609* **NEW!**

IBM Credit Lease \$130/mo.**

4MB RAM, IBM DOS and
Microsoft Windows preinstalled

\$3,789*

IBM Credit Lease \$137/mo.**

8MB RAM, IBM OS/2® preinstalled

Fastest!

- i486 DX2/66MHz processor
- 8KB internal cache
- High Performance SVGA VESA Local Bus Video with 1MB DRAM
- Internal i487™ math coprocessor
- 128KB L2 cache

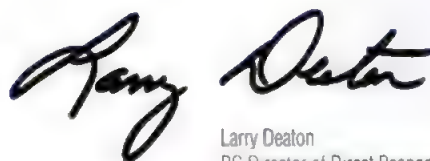
Easy Upgrades!

- Pentium® upgradable via Intel OverDrive technology
- RAM upgrades available

And More...

- 527MB (9ms) hard drive
- 3.5" 1.44MB diskette drive
- 8 slots (one 32-bit VESA Local Bus), 6 bays
- IBM enhanced keyboard/mouse
- 6319 SVGA NI FS 15" color display
- Networkable
- Industry Standard Compatibility

“One call gets
your specs, your
prices and your
kind of people.”



Larry Deaton
PC Director of Direct Response
Marketing and Customer Support
IBM Personal Computer Company-NA



We customize!
Call us now for a PC with your
specs, at your price

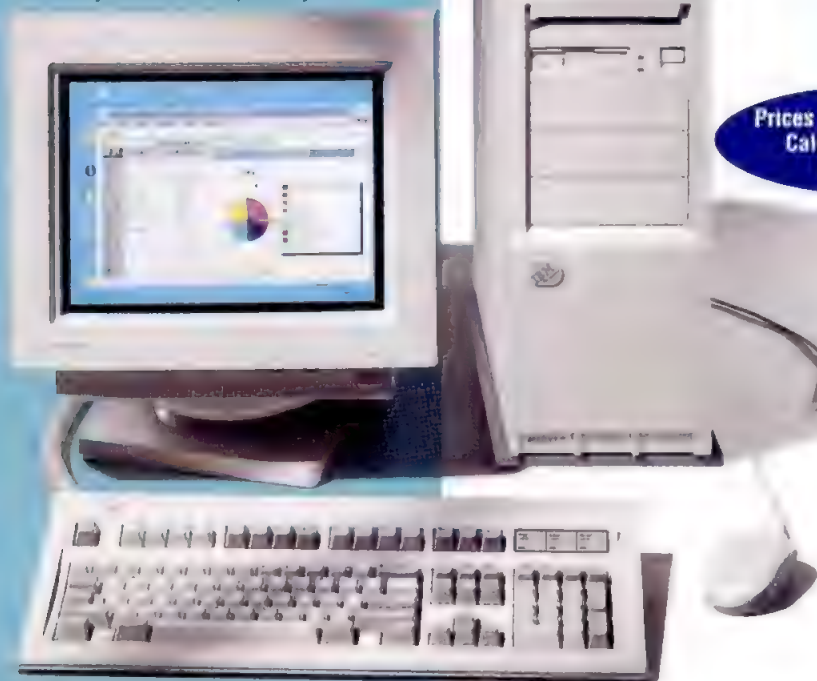
Prices may be even lower!
Call us today for the
latest quote.

Choose from quality components to have IBM PCs personalized for you.

If the systems on these pages don't meet your exact specifications, we'll customize an IBM PS/ValuePoint for you with your choice of

- Processors
- Hard Drive
- Floppy Disk
- Memory
- Display
- L2 Cache Memory
- Video DRAM
- IBM OS/2 or IBM DOS and Microsoft Windows

And more! Call us today for a quote



**The "PC" in
PC Direct stands for
personal computers —
and a good deal more.**

It stands for Personal Commitment. Any time of the day or night, the IBM Personal Systems HelpCenter™ is always available. It stands for Personal Care you can count on from professionals: the IBM Service Representatives

And it stands for the Personal Confidence that comes from knowing you're getting a quibble-free, 30-day moneyback guarantee plus one of the best warranties in the industry.

All of which is brought to you by the people who design, build, sell and service more PCs than anyone else. So while you compare how much PC you can get for the price, don't forget to factor the people behind the PCs into the equation, too.

Call IBM PC Direct today. Get to know the PC people you've always been looking for. And who'll always be there for you.

**The HelpWare™ Advantage:
Guarantees and personal service every step of the way.**

30-day moneyback guarantee
No qualms, quibbles or questions asked. If you're not happy, neither are we.

Expert help from PC specialists 24 hours a day. Need help

deciding, deciphering and demystifying? Call us and we'll help. We're always here 24 hours a day. You can also contact us by 24-hour bulletin board or automated fax, if you wish.³

Free 1-year onsite service. You send nothing to us, we come to you — with genuine IBM Service — no charge.³

Fast, genuine IBM Service. If you do need to call us, our own service representatives — not a third-party vendor — will respond. We have more than

10,000 service representatives, in more than 1,600 locations nationwide, backed by more than one billion dollars in parts.⁴

IBM Personal Computer Trade-in Program. If you need to replace your current systems give us a call... even if they're not IBM PCs.

IBM Credit Lease. Don't have ready cash to make your purchase? We offer an IBM Credit Lease to qualified commercial customers.

PS/ValuePoint 433DX/D

\$2,109

NEW!

IBM Credit Lease \$76/mo.**

4MB RAM, IBM DOS and Microsoft Windows preinstalled

Faster!

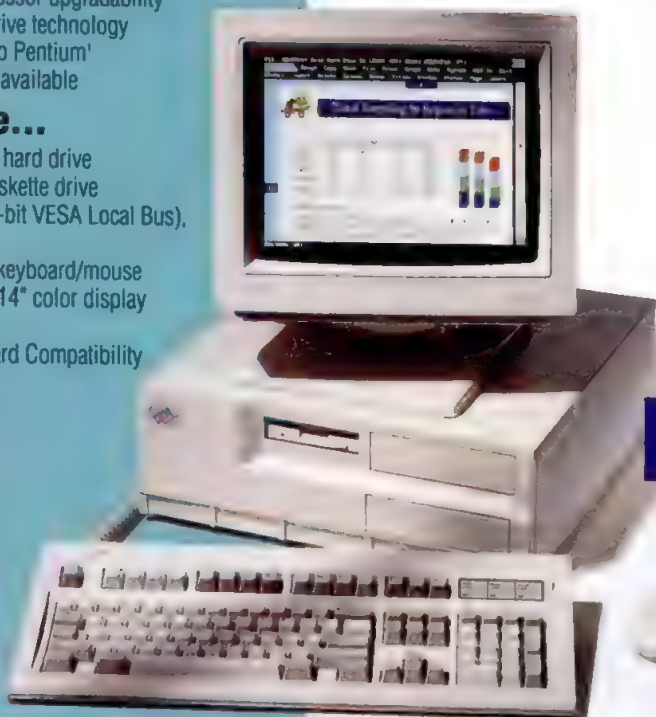
- i486DX/33MHz processor
- 8KB internal cache
- High Performance SVGA VESA Local Bus Video with 1MB DRAM
- Internal i487 math coprocessor

Easy Upgrades!

- Expanded processor upgradability via Intel OverDrive technology all the way up to Pentium¹
- RAM upgrades available

And More...

- 120MB (15ms) hard drive
- 3.5" 1.44MB diskette drive
- 5 slots (one 32-bit VESA Local Bus), 5 bays
- IBM enhanced keyboard/mouse
- 6312 SVGA NI 14" color display
- Networkable
- Industry Standard Compatibility



**FREE The IBM
PC Direct
Source Book**

This is it! The 1993 Spring/Summer Source Book for many of the most popular hardware, software and peripheral products for IBM and IBM-compatibles.

Call 1 800 IBM-2YOU
now for your free copy.

IBM PC Direct

*We're putting the personal
in personal computing.*

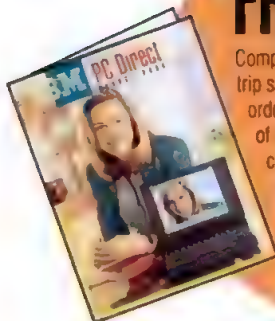
**Call
1 800 IBM-2YOU**

1 800 426-2968, refer to: X613PCM1
8am-midnight M-F, EDT; 8am-7pm Sat., EDT.



**Purchase order is available for
qualifying customers.**

All models are upgradable with Intel's future OverDrive processor based on Pentium processor technology. ¹Warranty and 30-day guarantee information available through IBM and IBM Authorized Dealers. Please call 1-800-426-2968 for details regarding IBM's moneyback guarantee and limited warranty. ²Copies of the terms of IBM's moneyback guarantee and limited warranty are available upon request. ³At no additional charge during warranty. ⁴Available Monday-Friday, 8am-5pm in your time zone, when serviced by IBM. If parts are required, this service is provided after receipt of parts shipped overnight. APPLIES TO IBM PC DIRECT SALES ONLY.



FREE The IBM PC Direct Source Book

Computing on the go? Then your next trip should be right to the phone to order your copy. It's filled with many of the latest PC products for computing in the office, traveling or at home. For your free copy **Call 1 800 IBM-2YOU now.**

Advanced notebook technology like ThinkPad deserves an advanced level of personal service.

When you're finished shopping for your ThinkPad, IBM is just getting started.

We're ready night and day with expert telephone assistance.

As for service, we can respond *anywhere* in the U.S.

And we back everything up with one of the best warranties in the business.

More reasons why choosing ThinkPad is smart thinking indeed.

The HelpWare Advantage: Wherever you go with your ThinkPad, we're with you all the way.

30-day moneyback guarantee. No qualms, quibbles or questions asked. If you're not happy, neither are we.¹

Assistance around the clock. It's as easy as calling our Personal Systems HelpCenter toll-free from wherever you are, anytime day or night. Or you can access us through bulletin board or automated fax, if you wish.

Free 1-year onsite service. That's genuine IBM Service — **no charge.** Unlike other notebook sellers, we don't expect you to send your notebook to us. Just call us and we'll come to you.

Onsite service from IBM Service Representatives. No dealing with third-party service vendors. Call IBM and IBM Service Representatives will respond. More than 10,000 service representatives in more than 1,600 locations nationwide make it possible!²

IBM Personal Computer Trade-in Program. If you need to replace your current systems give us a call... even if they're not IBM PCs.

IBM Credit Lease. Don't have ready cash to make your purchase? We offer an IBM Credit Lease to qualified commercial customers.

Computer ry personally. ainly do."

Scott Bower

Scott Bower
Director of Mobile Computing Brands
IBM Personal Computer Company-NA

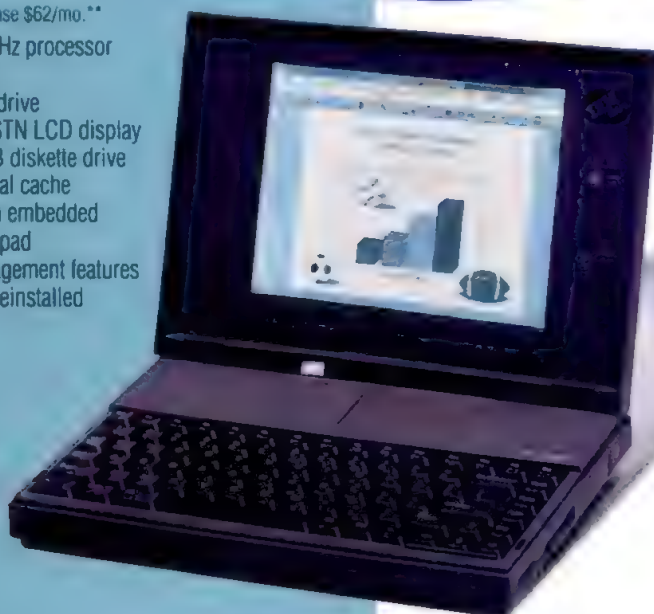
IBM ThinkPad 300

\$1,699*

IBM Credit Lease \$62/mo.**

- 386SL/25MHz processor
- 4MB RAM
- 80MB hard drive
- 9.5" mono STN LCD display
- 3.5" 1.44MB diskette drive
- 64KB external cache
- 82 keys with embedded numeric keypad
- Power management features
- IBM DOS preinstalled

Prices may be even lower!
Call us today for the
latest quote.



IBM PC Direct

*We're putting the personal
in personal computing.*

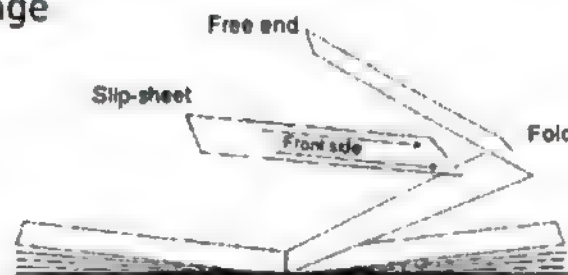
Call
1 800 IBM-2YOU

1 800 426-2968, refer to: X613PCM1
8am-midnight M-F, EDT; 8am-7pm Sat., EDT.

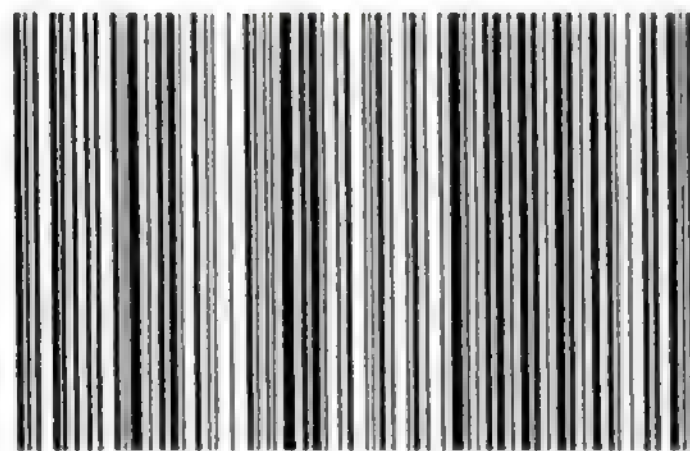


**Purchase order is available for
qualifying customers.**

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet



Inverted Foldout slip-sheet

Folded edge of the page

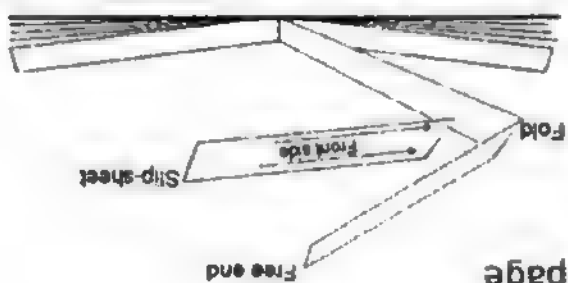
1. Open the foldout page
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

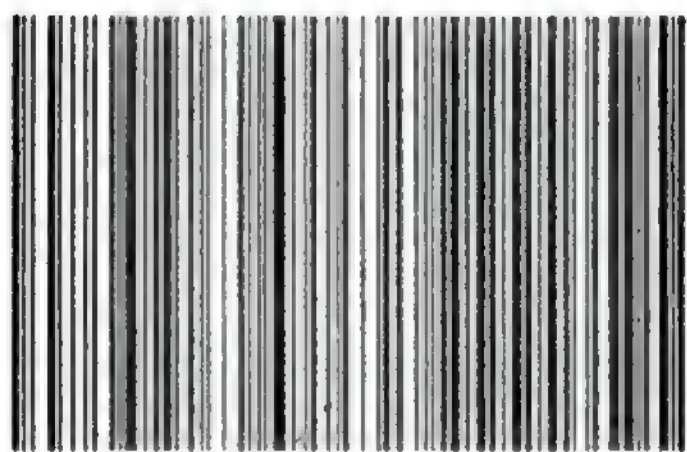
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-001B

Back

1. Follow instructions on the other side

IBM ThinkPad™ 700C

\$4,229*



IBM Credit Lease \$153/mo **

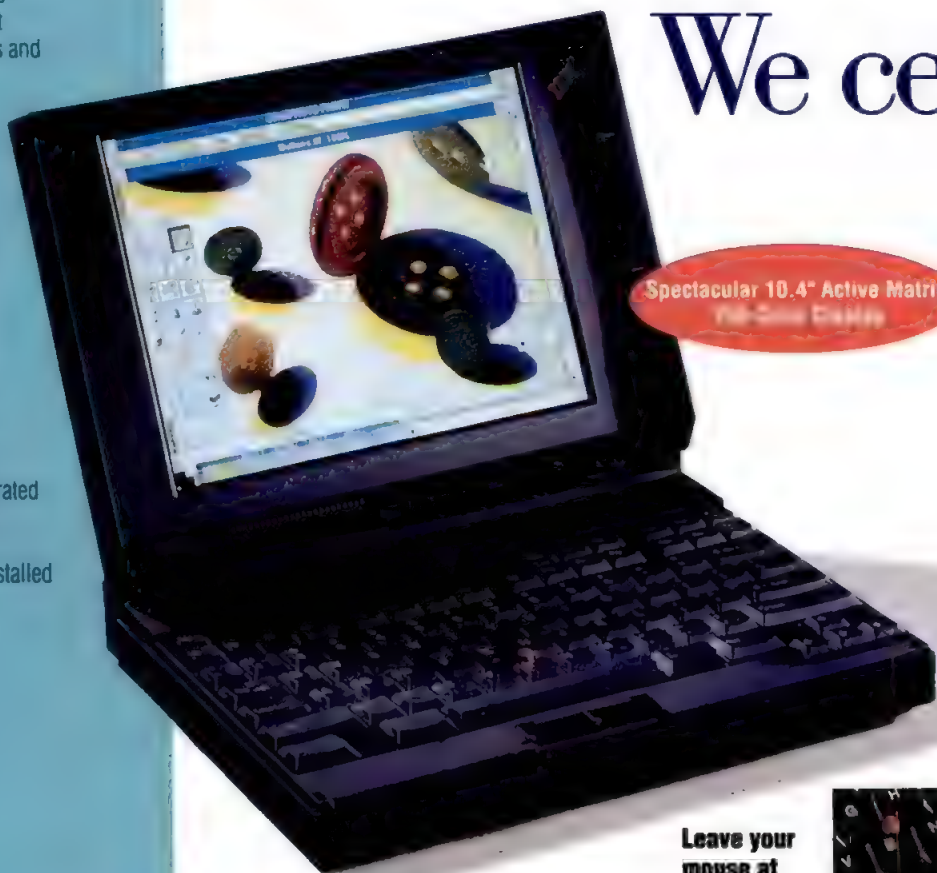
- 486SLC™/25MHz processor
- 4MB RAM
- 120MB removable hard drive
- 3.5" 1.44MB diskette drive
- 16KB internal cache
- 10.4" active matrix 256-color display
- Full-size keyboard with integrated TrackPoint II™ pointing device
- Advanced Power Management
- IBM DOS, Microsoft Windows and Prodigy® preinstalled

IBM ThinkPad 700

\$2,639*

IBM Credit Lease \$96/mo **

- 486SLC/25MHz processor
- 4MB RAM
- 80MB removable hard drive
- 3.5" 1.44MB diskette drive
- 16KB internal cache
- Full-size keyboard with integrated TrackPoint II pointing device
- 9.5" mono STN LCD display
- IBM DOS and Prodigy® preinstalled



**Spectacular 10.4" Active Matrix
Full-Color Display**

**Leave your
mouse at
the house**



ThinkPad 700 series models have the exclusive TrackPoint II cursor control built right into the keyboard. It's smooth, precise and easy to use.

Thinking options? May we suggest...

IBM Port Replicator for 700 and 700C	\$75
IBM Expansion Unit (docking station) for 700 and 700C	\$859
IBM Expansion Cartridge for 700 and 700C	\$425
IBM High Speed Internal Data/Fax Modem (14,400 bps/14,400 bps) for 700 and 700C	\$545

1. Warranty and 30-day guarantee information available through IBM and IBM Authorized Dealers. Please call 1-800-426-2968 for details regarding IBM's moneyback guarantee and limited warranty. Copies of the terms of IBM's moneyback guarantee and limited warranty are available upon request. 2. At no additional charge during warranty. 3. Available Monday-Friday 8am-5pm in your time zone, when serviced by IBM. If parts are required, this service is provided after receipt of parts shipped overnight. APPLIES TO IBM PC DIRECT SALES ONLY. ThinkPad EasyServ, our convenient courier repair service, is available for select models.



FREE IBM PC Direct Source Book.

You'll find it all and more in the latest edition. From the newest IBM PS/ValuePoint and ThinkPad models, to software, peripherals, printers, networking products, multimedia, anything and everything. **Call 1 800 IBM-2YOU** and we'll send one 2YOU today.



**"They listened,
they helped me,
and made it
easier to get
everything
I needed."**

Carla Hendra

Carla Hendra
Customer, IBM PC Direct

We sell personal computing products one person at a time.

What's the one thing you have common with millions of other computer products buyers?

You're different.

Whether it's hardware, software or peripherals, your needs are almost as unique as your fingerprints. But at IBM PC Direct, the unusual is usual and we pick up the phone ready for anything.

We can sell you just about any add-ons or software you want. In fact, if you don't see an IBM IBM-compatible product listed in our catalogs—a copy of which is yours for the asking—call anyway. Chances are we have what you need!

After all, keeping you happy is something we take personally.

PS/ValuePoint add-ons

PS/ValuePoint displays:		Price
6312 Color Display	6312001	\$379
6314 Color Display	6314001	\$439
6319 Color Display	6319001	\$349
6317 Color Display NEW	6317M01	\$999
Memory:		
2MB SIMM (70ns)	6450902	\$130
4MB SIMM (70ns)	6450128	\$265
8MB SIMM (70ns)	6450130	\$625
16MB SIMM (70ns)	60G1622	\$1,195
1MB DRAM KIT (PS/ValuePoint graphics)	60G1623	\$72
Storage:		
IBM 245MB AT® Hard Drive (IDE) NEW	32G4194	\$539
IBM 340MB AT Hard Drive (IDE) NEW	32G4195	\$719
IBM 527MB AT Hard Drive (IDE) NEW	32G4196	\$1,079
IBM 1.0GB SCSI Hard Drive NEW	6451052	\$2,279
IBM 3.5" Enhanced Rewritable Optical Drive	6451295	\$1,499
IBM 16-bit AT Fast SCSI Adapter (internal) NEW	32G4088	\$205
IBM CD ROM II Drive	6451104	\$489
IBM 3510 SCSI Enclosure	35100V0	\$215
LAN/Communications:		
T/R Adapter 16/4 AT	25F7367	\$535
T/R Adapter 16/4 II	03F0215	\$610
10 base 2 Ethernet® ISA	60G0615	\$140
10 base T Ethernet AT	60G0605	\$125
LAN Streamer MCA 32-bit card	92F8942	\$860
LAN Adapter/A Ethernet	48G7171	\$260
LAN Adapter Ethernet	48G7169	\$156

IBM LaserPrinter

\$1,510*

- Delivers up to 10 pages per minute!
- 300 dpi resolution for sharper images
- A variety of built-in fonts



**Prices may be even lower!
Call us today for the
latest quote.**

IBM PC Direct

*We're putting the personal
in personal computing.*

**Call
1 800 IBM-2YOU**

1 800 426-2968, refer to: X613PCM1
8am-midnight M-F, EDT; 8am-7pm Sat., EDT.



**Purchase order is available for
qualifying customers.**

*IBM prices only. The offerings, prices and products are subject to change or withdrawal without prior notice. Products you acquire may not be covered under any existing Volume Purchase Agreement. The same offerings and products may be available through IBM Authorized Remarketers. Remarketer prices may vary. Shipping and handling charges are extra. **IBM Credit Lease prices quoted are for 36-month terms. Lease rates quoted are good through 6/30/93 after which time rates are subject to change without notice. Lease available to qualified commercial customers only. *PRODIGY will not run without a modem. A modem is not included with the ThinkPad 700C or 700. A customer who acquires a ThinkPad 700 or 700C and a modem may contact PRODIGY to obtain a One Month Free Trial Membership. ThinkPad 700C, 700 and 300 systems and options are manufactured in Japan. PS/ValuePoint 6312, 6314 and 6319 Color Displays are manufactured in Korea. The PS/ValuePoint 6317 Color Display is manufactured in Taiwan. IBM, OS/2 and AT are registered trademarks of International Business Machines Corporation. PS/ValuePoint, SLIC, ThinkPad, TrackPoint II, HelpWare and HelpCenter are trademarks of International Business Machines Corporation. PC Direct is a trademark of Ziff Communications Company and is used by IBM under license. Intel and the "Intel Inside" logo are registered trademarks of Intel Corporation. Pentium, OverDrive, i486 and i487 are trademarks of Intel Corporation. Ethernet is a registered trademark of Xerox Corporation. PRODIGY is a registered servicemark and trademark of Prodigy Services Company. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation. ©1993 International Business Machines Corporation.

nodes are ideally suited for, but cannot yet take advantage of, Object Linking and Embedding (OLE) or Dynamic Data Exchange (DDE). Notes nodes can contain text that simply gives more information about a topic. Decision nodes show that an Issue has been resolved and can also show the nodes that led up to the decision.

If a discussion becomes unwieldy, you can collapse portions of it into Map Views that can be embedded within the main Map Views. Embedding maps is also useful for referring back to prior conversations.

As with any really new software, CM/1 has a rough edge or two that could stand to be smoothed. For example, it occasionally strays from accepted Windows conventions. Case in point: While the program is generally quite easy to use, each time you open up a new view, the program opens a new session of the application rather than opening a new window within a main shell. As a result, there are no controls to arrange open views neatly. Access the Windows Task Manager (Ctrl-Esc) to list your open applications, and you'll find it cluttered with every CM/1 view you have open.

There are other minor quirks. For instance, CM/1 replaces the traditional Windows File menu with a menu titled System (which includes print and search commands, as well as some window controls). Also, you cannot print the full text of a map directly from CM/1. The Print Text option is really an export option that creates an RTF (Rich Text Format) or an ASCII outline file. And the Print Map option lets you print only to PostScript-compatible printers.

BROAD TALK

CM/1 is very capable at handling large, wide-reaching discussions. Yet it currently doesn't support any form of remote access. So if you're on the road, don't expect to be in on a CM/1 discussion.

CM/1 runs on any PC network. NetWare users can take advantage of the Btrieve NetWare Loadable Module (NLM) record manager to speed up the program significantly. CMSI has Unix and Macintosh versions in the works.

CM/1 is rather expensive. A single-

user version of the program costs \$1,500. Multiuser licenses can lower the program price to \$780 per user for 200 users. CMSI also provides consulting services to help you get up and running quicker.

CMSI is a small company and has thus chosen to market CM/1 initially toward carefully selected industries (such as defense, utilities, pharmaceuticals, aerospace, and telecommunications) that deal with extremely complex issues over long periods of time. But the product is so simple to use that it can become an invaluable tool for any group or individual who must explore complex issues with unknown answers.

Keyfile Corp.

Keyfile

BY GREG PASTRICK

As a comprehensive document and workflow management tool, with robust image- and document-annotation features built around a customizable set of object-oriented tools, Keyfile 2.0, from Keyfile Corp., is an ambitious piece of programming. By breaking down the barriers between paper and electronic data, Keyfile brings you an all-in-one way to manage documents and files across a group.

You should understand, up front, that Keyfile is object-oriented programming—big time. It uses a desktop metaphor to organize documents and workflow. Documents are stored in filing cabinets or folders and are manipulated with fully drag-and-droppable tool objects. Such features as the object-oriented interface, keyword-indexed document storage, a suite of application file viewers, and TIFF-it (a nifty document-to-image conversion technology) all contribute to Keyfile's power and versatility.

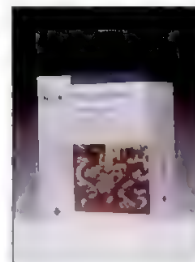
The product comes in two multiuser versions and a Personal Edition. The full-blown Enterprise Edition (for large workgroups, \$4,995 plus \$995 per workstation) requires an OS/2-based server. We looked at the Workgroup Edition (\$2,995, maximum of five users), which runs off a Windows 3.x server and has all the document-handling features of the Enterprise Edition.

In addition to the document server and (up to) five connected workstations,

a Workgroup Edition installation has a server for each peripheral (such as printer, scanner, fax, and so forth) that will be used to receive or distribute documents.

OBJECT KEY

The Keyfile desktop comes equipped with a powerful collection of document-



and image-handling tools, including objects for launching applications, accessing hardware, creating new objects, and automating workflow tasks. Also provided are tools for

trashing and shredding files and customizing tools to use with Keyfile's KOALA scripting language.

Since, as mentioned, Keyfile treats everything as objects, all of Window's drag-and-drop rules apply. Thus, performing an action in Keyfile usually requires little more than dragging a document icon and dropping it on top of another icon. To share a financial report with a marketing group in the Keyfile milieu, for example, you simply grab the file icon and drop it on the labeled file cabinet icon set up for access by all members of that group. Similarly, to print or fax a letter, you grab the

FACT FILE

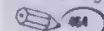
Keyfile, Version 2.0

Keyfile Corp., 22 Cotton Rd., Nashua, NH
03063; 603-883-3800; fax, 603-889-9259

List price: Workgroup Edition, \$2,995. Advanced peripheral server, \$995. MHS communication server, \$995. Optical disk support, \$995; 5-slot optical disk support, \$1,995; 11-slot optical disk support, \$2,995.

Requires: Server: 16MB RAM for dedicated servers recommended. Workstation: 386-based PC or better, 8MB RAM, VGA display subsystem, DOS 5.0, Microsoft Windows 3.1.

In short: An object-oriented interface, a suite of application file viewers, and its TIFF-it rasterization technology are some of the feature highlights that make Keyfile a strongly integrated document-management package. The system, however, requires a good measure of technical hand-holding and support to set up and use its tools to its greatest advantage.



ON-READER SERVICE CARD

The not-so-hard drive upgrade.



The Hardcard EZ™ hard drive is absolutely the easiest way to add high-performance drive capacity to your system.

And choosing the Hardcard EZ drive is even easier, because Quantum guarantees it's compatible with everything else in your computer — or your money back.

It's guaranteed to run with any 286 or later PC/AT system and all your popular operating systems like MS-DOS, OS/2 and Microsoft Windows. It's guaranteed to coexist with your current drive, too. So you don't sacrifice existing storage to increase your capacity.

And anyone can install the Hardcard EZ hard drive — even if you've never seen



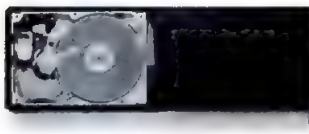
the inside of a computer. Just drop it into an expansion slot, run the automatic installation software, and you're ready to grow with

42,85,127 or 240 MB of added capacity.

Manufactured by the makers of the original Hardcard® hard-disk-on-a-card, Hardcard EZ upgrades contain full-featured Quantum drives renowned for the highest performance and reliability and backed by a two-year worry-free warranty — twice as long as most other drives.

See your dealer today or call 1(800) 624-5545 to find out more about the Hardcard EZ drive.

It's the hard drive upgrade that's easy to add.

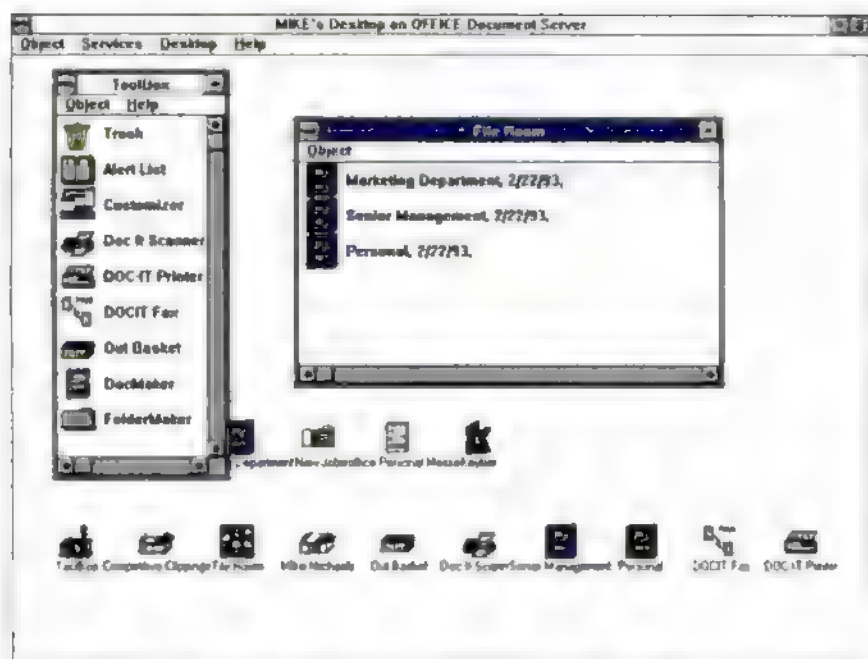


The Hardcard EZ drive is a full-featured, high-performance Quantum hard drive.



You can install the Hardcard EZ hard drive by yourself in about 10 minutes.

Quantum™



On the Keyfile desktop, everything (including the application itself) is an object.

icon depicting it and drop it on the icons representing the attached fax or printer hardware.

Users share not only documents but the homemade, task-oriented applications, or objects, that help manage them. For example, once a successful draft-approval-routing work flow has been created it can become a prototype, easily accessed and modified for similar tasks.

GROUP TOOLS

Among the Keyfile features essential to sharing information is TIFF-it. TIFF-it creates a graphical image of a data file (regardless of file type), essentially an electronic printed page. It is this electronic page that is circulated amongst the workgroup for annotation and comment, not the original data file. Users can type or draw freely on the TIFF-it image, while the integrity of the original document is maintained. If you've ever marked up a report, it's not much different; TIFF-it just lets you do it electronically. This image remains attached to the original file as it is routed from user to user. One person, usually the document originator, ultimately integrates the TIFF-it comments into original the file.

A special type of comment, known as a TypeMATIC field, allows the entry of structured, formatted text on top of the TIFF-it image. Users can even create their own forms, such as a fax cover sheet, with these tools. Future versions of Keyfile will allow Windows audio format (*.WAV) file attachments and OLE.

The system's ad hoc and structured document-routing capabilities are pri-

marily defined by the JobMaker tool. JobMaker's approach to routing relies on building a series of basic steps or a sequence of events that must be completed or addressed before the next step is triggered. These include routing for information only, defined response, wait for documents, and job done.

JobMaker eases the process of creating routing structures with a series of dialog boxes used to build the details and define the attributes for each step. A typical job might require defined responses to an attached document or image from a list of users in a given workgroup. As each user responds to the document, it may then be passed to the next participant in the work flow. Users may further refine the flow by adding due dates, alerts for overdue work, and notifications to the job originator.

On the hardware side, Keyfile supports a solid list of fax, scanning, printing, and storage devices. Among them is Okidata's DOC-IT. Okidata and Keyfile worked together to develop DOC-IT drivers for Keyfile, and the device's built-in printer, scanner, and fax (as well as copier) make it an especially apt companion for Keyfile.

Don't let the shrink wrap on the box fool you. Once set up, the accessibility of Keyfile's tools and the power of its storage and peripheral-server functions make this a robust package. But the burden of making it a practical system for the group falls on the system integrators who initially set it up and the administrator who sees that it doesn't fall down.

The company recommends a NetBIOS-compatible Ethernet network for best results, and though the installation and initialization of the system are totally automated, setup and maintenance of the dedicated document and peripheral servers require an experienced hand. Setting up individual and group security rights, privileges, and protections is neither difficult nor time consuming, but it does require a clear understanding of the levels of access required by groups and individuals. Keyfile recommends high security

on personal folders, with liberal access to group folders, filing cabinets, and tools.

Keyfile's documentation won't prove to be of much help for the novice user attempting to handle these system setup tasks. The product is typically installed by VARs or system integrators, and that's not likely to change any time soon.

Pushing document management and work-flow automation into the mainstream is a daunting task, even at the small-group level. The capital investment to acquire workstations with enough memory and processing power to do a program like Keyfile justice is considerable, and the necessary peripherals are no less a significant investment. The need for an efficient and accessible small work group system is there, however, and Keyfile has a serious product and system to meet the challenge.

Lotus Development Corp.

Lotus Notes

BY TONY POMPILI

It's a paradox. While it's far and away the best-known and most widely used groupware product in the PC world (some peo-

FACT FILE

Lotus Notes, Release 2.1A

Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8500; fax, 617-693-1299

List price: \$495 per node.

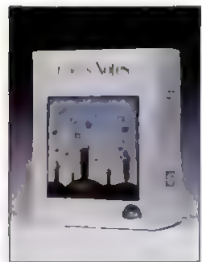
Requires: Server: 386-based PC or better, 8MB RAM, at least 100MB hard disk space. Server operating system: OS/2 Standard Edition or Extended Edition 1.2 or 1.3 or Pathworks 1.1 for OS/2. Server network software: NetWare Requester for OS/2 1.1, 1.2, or 1.3, OS/2 EE 1.2 or 1.3 (with LAN Services); VINES 4.10, or Pathworks 1.1 for OS/2. Workstation: 286-based PC or better, 4MB RAM, 40MB hard disk space, Microsoft Windows 3.0 or 3.1 (protected mode only), Pathworks Workstation network software: NetWare 2.15; IBM LAN Server; Microsoft LAN Manager 2.0; VINES 4.10; or Pathworks 4.0 for DOS

In short: A general-purpose communications product, Lotus Notes combines full-text flat-file database capabilities with multisite e-mail for building company-wide multiuser information-routing applications.



ON READER SERVICE CARD

ple regard it as the *only* one), Lotus Development Corp.'s Lotus Notes, Release 2.1A, remains a mystery to the vast majority of PC users. Nevertheless, for geographically dispersed organizations interested in information collection, delivery, and routing systems that can be quickly developed and implemented, Notes is a tool without equal. Lotus Notes, Release 3.0, (announced as we were going to



press) may change part of this equation. With a new pricing strategy that will make it affordable for small offices and the ability to run on multiple platforms, Notes may realize

greater understanding through wider acceptance. (See First Looks in this issue.) So, what is Notes? A simple, one-dimensional answer: Notes is a database. Additional dimensions: It's a *distributed multiuser* database. (The information lives simultaneously in several places and can be accessed both over a LAN and via remote dial-up.) It is a *multiformat* database. (Different database templates are provided for tracking, reference, discussion, and information "broadcasting.") Further, Notes incorporates message transport (e-mail) and a programming language with functions to control everything from string manipulation to data validation to document routing. All of this is built on top of technology (the "engine") that allows Notes to operate over virtually unlimited geographical areas in something approaching real time.

THE ENGINE

In a typical Notes installation, copies of the *database* (the aggregate of all the organization's "publicly accessible" and private mail databases) are placed on geographically separate database servers—say, one each in the Boston, Chicago, Seattle, and Tulsa offices—that communicate via dial-up phone lines. Notes keeps all of these copies synchronized and up to date through periodic "replication," a key element of the Notes engine; at regular intervals (say, hourly), Notes compares these databases copies, marking documents that have been added, deleted, or modified. Where it

finds differences, the Notes engine automatically reconciles them, updating each outdated database as necessary. Since only changes are propagated (as opposed to entire databases being copied), information transfer is kept to a minimum.

In the same way that Notes keeps copies of the aggregate database on separate servers, users keep their own local copies of individual databases they work with (including, of course, their personal mail databases). They can replicate these, as needed, with their local file server, either across the LAN or via the remote dial-up module. A replication session for a user can involve several events, such as sending (and receiving) mail messages, uploading a document to a tracking database, and adding comments to an ongoing discussion.

The net result of all this is that all users on the system, whether at their desks or on the road with their laptops, have concurrent access to the same information (albeit with some time lag).

WHAT RUNS ON WHAT?

The hardware/software configuration of a typical Notes site is as follows: The 2.1A Notes Server software runs on a system using OS/2 1.3. (Notes 3.0 will run under OS/2 2.0 and Windows initially, with other versions to follow.) Currently, Release 2.1A has clients for both OS/2 1.x and Windows 3.x. (Notes 3.0 will also have an OS/2 2.0 front end.) Workstations connect to the Notes server through NetBIOS running on a variety of popular LANs, including LAN Manager, NetWare, and VINES.

Fortunately, the complex underlying communications architecture that drives Notes is totally transparent to users. What they see is the client interface or front end; what they interact with is *applications* (task-specific databases, created by anyone from end users to professional programmers).

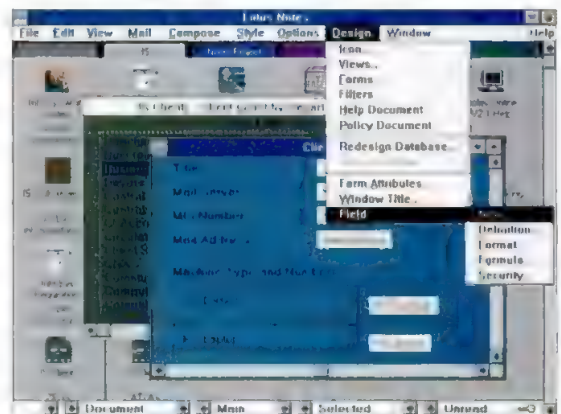
Take a sales-tracking system, for example. Such an application might collect the same kind of data as a standard flat-file database package doing the same job (customer name and address, line items, quantity, billing and delivery dates, and

the like), but with Notes, data could be input locally at each server and automatically consolidated via replication. Also, a Notes application could easily automate further details, such as routing reports to, say, the sales manager or the credit department, depending on specified conditions.

THE FORM'S THE THING

Developers can build such data flow automation into the forms used to input information into Notes databases. Notes forms can include a variety of special field formats such as radio buttons, check boxes, and small look-up tables (Choices Lists). Many of the 188 functions built into the Notes programming language can be linked directly to these controls.

The Notes engine takes care of moving documents and messages automati-



Fields in Lotus Notes forms can be programmed to validate data and provide routing information.

cally among databases, on the same server, or at a server on the other side of the world. A key resource in this process is the Notes Name and Address Book, which contains entries for all of the databases in the network, including individual mailboxes.

READING YOUR NOTES

Finding and presenting information are two of Notes' weaker areas. The package does provide a customizable browse format called Views, which allows developers to slice up documents into convenient displays focused on selected information. Our sales-tracking system, for example, might have a View showing filled orders and another showing pending orders.

The package lacks the kinds of report-



SAVE \$100 ON ONE LAN CONNECTION. GET ANOTHER ONE ABSOLUTELY FREE.

\$295.00

The Versatile Yet Affordable Pocket Ethernet LAN Adapter.

The Kingston Pocket Ethernet Adapter features both popular Ethernet LAN interfaces and is priced \$100 less than the competition's single interface adapters. It connects to the parallel port of any laptop, notebook or desktop PC and is compatible with most popular network operating systems including Novell Netware, Microsoft Windows for Workgroups and LAN Manager.

Individual Product Testing.

As a member of the EtherRx network products family, every Pocket Ethernet Adapter is bench tested before it's shipped. Our exclusive loopback transmit/receive test suite evaluates each adapter 32 times to assure data integrity. This unequalled quality control process leads to many years of reliable service.



Convenient Dual Interface Connectivity.

The new Kingston Pocket Ethernet Adapter supports both twisted pair and thin coaxial cabling for 10BASE-T and 10BASE2 networks. It's like getting one adapter for the low price



of \$295 and another one absolutely free.



Kingston Reliability.

Pocket Ethernet Adapter users enjoy the same reliability customers have come to expect from Kingston memory and processor upgrades. Every product is supported by free comprehensive technical assistance and backed by a full five-year warranty.

Another Free Connection.

Contact your nearby Kingston dealer or call us at (800) 435-2620. We'll be happy to answer your questions about our full line of EtherRx networking products or any of our other 625 upgrade products.

[800]

CIRCLE 106 ON READER SERVICE CARD

Kingston
TECHNOLOGY CORPORATION

THE INSIDE NAME IN UPGRADES

17600 Newhope Street, Fountain Valley, California 92708 (714) 435-2600 Fax (714) 435-2699

All trademarks and registered trademarks are of their respective holders. Kingston and Kingston Technology are Registered Trademarks of Kingston Technology Corporation.

■ Building the Perfect Office

by Lance Ulanoff

With WordPerfect Office 4.0, WordPerfect Corp. promises to give "a whole new meaning to e-mail" (that is, "groupware"). We took a long hard look at an early beta version (at this writing, Office was scheduled to ship in late spring). Certainly, it leaps ahead of its own 3.1 predecessor. Still, in spite of the seamless integration of rules, routing, and group scheduling (in a rich suite of office tools) and its cross-platform and wide area network functionality, Office 4.0 may just fall on the borderline of groupware.

Even so, Office 4.0 appears to have the groundwork in place for even greater strides over the groupware line. To wit, WordPerfect will release Office on multiple platforms—DOS, Windows, and Macintosh—simultaneously; Unix should follow sometime thereafter. In addition to total cross-platform functionality, Office will also have an underlying WAN substructure for tying together larger offices across servers and post offices. Additionally, an asynch gateway will ship with Office, and gateways for SNADS and PROFS will be available approximately three months after the first Office shipment. Along with a fax/prINTER gateway, connections for popular mail transport systems such as Novell MHS, SMTP, and X.400 will also be available, all at additional cost. According to WordPerfect, gateways for AT&T EasyLink, MCI Mail, and Verimotion Memo should be available sometime after 4.0 ships.

GROUPABILITY

Among the clearest signals of Office's groupware intentions are new workflow-control abilities. Office 4.0 adroitly ties a simple routing engine to its e-mail system. By simply selecting a list of addresses, users will be able to create a simple routing slip for a message, task, or appointment. If there is an attachment, users could open it, work on the

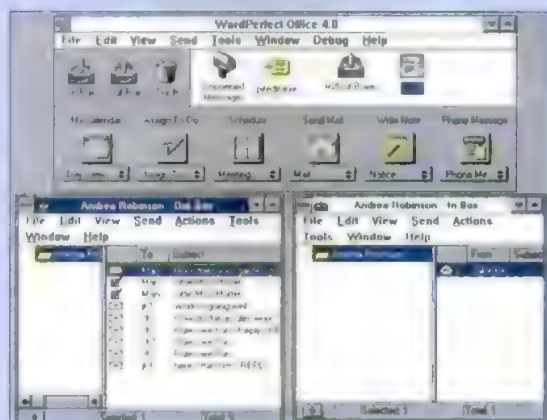
file, then check the completed box, and the message (and attachment) will automatically move on to the next addresses on the list. Users will also be able to save routing slips by adding the list of users to their personal groups as a "Route Group."

Inform's (WordPerfect's new forms-building product, which should be shipping by the time you read this) would appear the perfect companion product

Office will also search inside message text to complete a rule. For example, if the word *bills* is a keyword for a rule, any message including that word will be acted upon accordingly. Rules can be invoked or disabled at any time.

MORE MAIL

Mail message creation and reception has also been enriched in Office 4.0. Additions include spell-checking, additional attachment viewers, and an out-box that tracks tasks, appointments, and messages. To check the status of mail or an RSVP for an appointment, users simply double-click on the item in the out-box, opening an information screen that includes a complete list of user activity on the message. But the one feature that regularly brings a sly grin to most faces is the ability to retrieve unopened mail messages sent by you to someone else's mailbox. Just imagine having sent, in a fit



The main window in WordPerfect Office 4.0's Windows client will feature a "Shelf" where users can save custom and proxy views.

of pique, a caustic message to your boss. The feeling passes, but the message is still out there. If a look at your in-box shows the message you sent as unread, you're in luck; you just retrieve it.

of pique, a caustic message to your boss. The feeling passes, but the message is still out there. If a look at your in-box shows the message you sent as unread, you're in luck; you just retrieve it.

AUTOMATE IT

The inclusion of rules will help Office act as the secretary so few of us have. They can be designed to act on e-mail according to user-specified instructions. Included in these rules are numerous variables on the type of incoming or outgoing mail, such as sender, type of attachment, sender priority, and others. Under an action box, the user sets what series of actions will be taken on a message, including forwarding, saving to a message folder, and copying. Office 4.0 will even offer in its list of actions the ability to launch an application.

REMODELING OFFICE

Office's DOS and Windows interfaces are similar in some respects. The Windows interface has been redesigned with an innovative all-in-one Main Window. Along with in- and out-box icons, it contains buttons for the calendar, memos, phone messages, mail creation, appointments, to-do, and more. An initially empty window area in the upper-right-hand section of this shallow box contains Office's new "Shelf" feature, where users will be able to save custom views, often-launched apps, and the schedules, mail, or calendar views of others.

While duplicating almost all of the features of the Windows client, the DOS client is not overly graphical (read "not GUI-DOS"). Nevertheless, it does have windows with scroll bars that support resizing and minimizing.

Every Office 4.0 screen or window is known as a view. But what if you don't like Office's calendar or mail message window? One answer here may be to roll your own. In addition to having a cadre of premade views, WordPerfect has included a View Editor so that users can create and save their own custom views.

DELEGATOR

Executives usually have assistants, and those assistants often handle their mail, messages, and schedules. With its multilayered security options and Proxy feature, Office will be well prepared for this type of working situation. Using an Access List, users will be able to set individual and group read and write privileges for each part of their Office suite. Providing they have the right, they could "proxy" another user and view the other's mail, schedule, or any other part of his or her Office suite. For example, an assistant could proxy a superior's mail window, drag a small icon from the window's upper-left-hand corner onto Office's Shelf, name it Boss's Mail, and then view it alongside his own mail window at any time.

Proxying also comes into play when scheduling a group appointment. Users could invoke proxy (if they have the right) to view others' calendars and schedules, have Office automatically search for free time among a list of users, or use the free-and-busy-times grid to select the best time for the meeting.

Office probably won't be the perfect word for groupware. But for WordPerfect shops that will gain added integration between their existing WordPerfect apps, Office 4.0 will probably make the office a little "suite-er." □

ing features we expect from a "true" database. As a workaround, you can do basic totaling in Views, then print your Views to produce rudimentary reports. Notes, Release 2.1A, includes a rudimentary text search feature, but Release 3.0 will offer full-text searching through indexing.

THE BOTTOM LINE

Lotus asks \$495 for each server or workstation node (and offers volume discounts). This is not Notes' full cost, however. Server setup (on OS/2 file servers, remember) is complex and likely to require technical assistance. Once set up, servers need to be maintained, as do the applications, databases, and Address Book. And Lotus Notes applications often need to be custom created with tools provided. So in addition to hardware and software, expect also to add people resources.

On the surface, Notes 2.1A appears unimpressive, almost kludgy. Its interface is far from sexy, its search and reporting tools primitive. Beneath the surface, however, it is powerful and robust. And it is likely to remain a dominant force in groupware for a long time to come.

Portfolio Technologies Inc.

Office.IQ

BY JAMES KARNEY

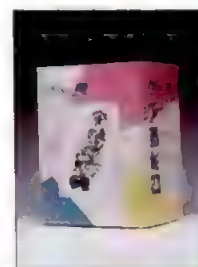
Office.IQ makes using Windows a bit like working in a virtual office. Instead of running applications and loading files, you deal with projects. It offers tools for collecting related files into one document, called a *work package*. You can send the entire collection to other users, complete with electronic notes. Sold in groups of five at \$1,995, this first offering from Portfolio Technologies provides workflow routing, custom search procedures, and extended filenames that make it easy to locate and distribute information as well as see who is using it. Project managers can use Office.IQ to control access to information and track completion of milestones.

Office.IQ provides an object-oriented desktop for each user where work packages are stored in icons that look like

folders. Files can be grouped in these folders or displayed as individual elements on the desktop. Clicking on a folder opens a window displaying its contents. Clicking on a file-related icon loads the file with its parent application. The program uses the Windows file-type associations.

A VIRTUAL WORKSPACE

Using the Office.IQ environment is much like sitting at a desk. It provides an In/Out Box for sending and receiving objects that can include work packages,



faxes, notes from other users, and even multimedia objects. A Trash Can icon is used to destroy objects. The vertical sidebar on the right-hand side of the program window

is used to create objects and new work packages. You first drag a folder template onto the desktop, then drag task-related objects into it. These can include files from almost any DOS or Windows application.

You can create multiple desktops, each tailored to a specific task or project. Clicking on a box at the base of the sidebar lets you switch from one desktop to

FACT FILE

Office.IQ

Portfolio Technologies Inc., 5600 Mowry School Rd., #100, Newark, CA 94560; 510-226-5600; fax, 510-226-8182

List price: For 5 users, \$1,995, for 100 users, \$13,965

Requires: Server: 4MB RAM, 40MB hard disk space, NetWare 3.11 or later Workstation: 4MB RAM, DOS 3.3 or later, Microsoft Windows 3.1, 8MB swap file

In short: Office IQ's object-oriented approach to workflow management offers workgroups a simple-to-use system that handles document routing, controlled access to files, and document management by using easily defined templates. It's a great tool for project managers who need to control access to information and track completion of milestones. This first release is a little rough around the edges, but it is easy to install and operate. While it may not suit those needing tight controls, it will satisfy many less rigorous users.



ON READER SERVICE CARD

Open Windows for Workgroups

by Craig Stinson

Unlike many of the other programs reviewed here that attempt to put the power of groupware into the hands of the end user, Microsoft Corp.'s Microsoft Windows for Workgroups 3.1 network operating system places the power of groupware *development* into the end user's hands. By extending the basic Windows operating environment through the addition of Network Dynamic Data Exchange (NetDDE) and the implementation of the Simple Messaging Application Programming Interface (Simple MAPI), Windows for Workgroups provides the tools to enable users in ad hoc workgroups to develop their own groupware applications.

On the surface, Windows for Workgroups is much like other peer-to-peer LAN operating systems, such as Artisoft's LANtastic and Novell's NetWare Lite. The program easily enables users to share storage devices such as hard disks and CD-ROMs and peripherals such as printers and modems.

Windows for Workgroups also comes with starter apps that demonstrate the power of connectivity. These include Mail, a single-post-office version of Microsoft's e-mail program; Schedule +, an agenda manager and meeting planner that works hand in glove with Mail; Chat, a utility that lets users type directly onto others' screens; and Network Hearts, a rendition of the classic card game playable by up to four workgroup members.

Windows for Workgroups offers enhancements over single-user Windows designed to simplify the communal use of data objects, files, and hardware. File Manager, for example, now includes a command that lets you make any local directory available to others and a second command that rescinds the privilege. Print Manager has similar commands for sharing printing resources. And the Clipboard has not only a new look but a new name as well. Called

Clipbook Viewer, the enhanced utility finally allows users to create disk-stored scrapbooks of objects that are cut or copied to the Clipboard. More important from the standpoint of collaborative work, it also lets you make any such object available for shared use.

With File Manager, Print Manager, and Clipbook Viewer, the person "owning" the resource can restrict shared access via a password. And for files and

programming interfaces will enable commercial in-house developers and end users (albeit power users) to generate more elaborate groupware products than Microsoft itself has yet provided.

Windows users have long been able to take advantage of DDE (Dynamic Data Exchange), which provides dynamic links between applications. NetDDE extends this capability by enabling the user to launch the linked appli-

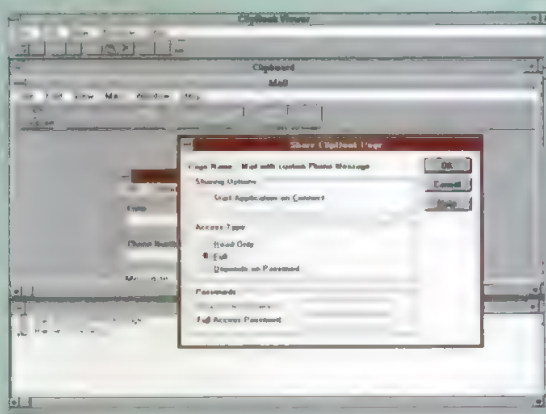
cation (known as the DDE server) even if it resides on another user's system. On the most basic level, this allows for the simple creation of collaborative documents. One user can work on the master document while others update embedded spreadsheets, graphs, or artwork.

NetDDE can be taken a step further, however. By enabling a user to launch applications that reside on other systems in the workgroup, processes can be developed

that take advantage of special hardware on other systems, such as a high-speed modem or 3270 gateway. Tasks can even be created that distribute processing of complex data across multiple systems.

NetDDE can be accessed from any Windows application that currently supports standard DDE calls, such as the macro languages in Microsoft Word for Windows and Microsoft Excel and programming languages such as Microsoft Visual Basic. Microsoft has built security features into NetDDE similar to those found in File Manager and Print Manager.

The manual interface to NetDDE is the Clipbook Viewer. If a data object arrives on your clipboard via an application that supports DDE, you may paste-link that object into a DDE-supporting client program and thereby effect a permanent link to the data source.



To initiate a NetDDE link, data must be copied to the Clipboard, then pasted into the server's local Clipbook.

Clipbook objects, the sharing may optionally be made read-only.

More subtle group-supporting enhancements appear in the common dialog boxes that many Windows applications now use. Microsoft's COMM.DLL now includes a Network button, making it easy for users to read remote files without first going through File Manager. If you're not logged on to the network when you try to grab a remote file, the enhanced DLL will even offer to log you on, saving you a trip to Control Panel.

Mail and Schedule + are highly serviceable applications. Along with Windows' new file-sharing services, they will bring joy to users who are now playing phone tag and flipping disks over office partitions. Lying directly behind the veil are two powerful software engines: NetDDE and Simple MAPI. These pro-

The Network Hearts game and Chat applet show how NetDDE can effectively drive the same application on two or more workstations simultaneously.

MAIL ENABLED

Simple MAPI is a subset of Microsoft's forthcoming Mail Applications Programming Interface that includes a dozen functions for sending, retrieving, and managing mail. The Windows for Workgroups Mail program uses Simple MAPI to implement a rudimentary workgroup communications system whereby users can send, receive, reply to, and forward messages, with or without attached files. Other Microsoft applications (Excel, Schedule +, and Word for Windows), as well as third-party applications such as Symantec Corp.'s Norton Desktop for Windows, also support Simple MAPI and immediately become "mail enabled" when Windows for Workgroups is installed.

The 12 Simple MAPI functions can be found in the MAPI.DLL Dynamic Link Library. Many Windows applications can access DLLs through their macro languages. For instance, a user savvy in Excel programming could create a mail-enabled expense-tracking spreadsheet that will notify group members if it has not received their latest expense data or if their expenditures are over a certain threshold.

The foundation for all of this is in the Windows for Workgroups box. The elaboration is back in the user's hands. □

► FACT FILE

Microsoft Windows for Workgroups, Version 3.1

Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080; fax, 206-936-7319.

List price: For one user, \$249.95.

Requires: 386SX-based PC or better, 3MB RAM (4MB recommended), 9.5MB hard disk space (14.5MB recommended), VGA or better, DOS 3.3 or later.

Circle 467 on reader service card

another. For a report, the desktop might include several folders related to the project.

A NEW FACE

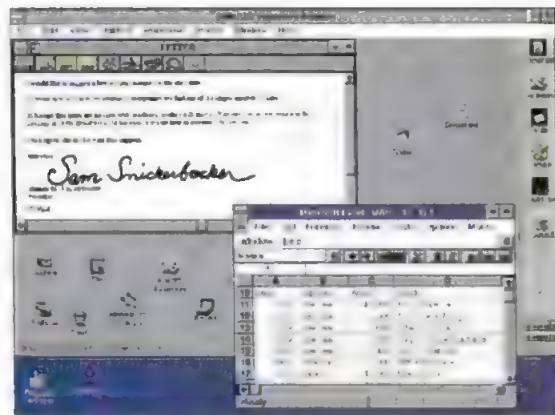
The Office.IQ interface took a little bit of getting used to. Those comfortable with Windows may find the object-oriented approach a bit awkward at first, but grouping your work by project makes it easier to get things organized. Finding a file and controlling access are a lot easier than with DOS or the Windows File Manager. Information about an object (called *attributes*), including a 32-character name, subject, object type, title, who created it, a reference number, and keywords, are all stored in the program's database. You can browse through folders or execute a search using any combination of attributes. We were able to locate documents related to a specific project and author with ease. One shortcoming is the lack of any way to enforce what attributes must be filled in. The only mandatory field is the filename, so you may not be able to make a complete search using a key attribute.

Access to files can be limited to individual users or defined groups by whoever initiates the work package or by the system administrator. You can set up as many groups as you wish. During our testing, we set up one set based on the people working in a department, then broke out subgroups for specific tasks.

A check-out/check-in procedure ensures that only one person can make changes to an object at a time. Though the same object can appear on several people's desktops simultaneously, only one master copy exists. While one person is working on an object others can read it, but they must wait until it is free to make changes. The check-out process could be improved. There's no way to limit how long a file can be checked out.

MOVING YOUR WORK ALONG

Instead of just moving files, a work flow defines and enforces the way the information is routed and handled. The designer of a work flow uses drag-and-drop icons to set up the order in which a series



Office.IQ offers a simple interface for creating compound documents and managing work flow across a workgroup.

of tasks is carried out and to select the basic set of files that are routed from user to user. Then the related objects are automatically routed to all the recipients. They perform their part of the project, add any new documents to the package, and send it on its way. Since the documents are all accessed from the database, users are working with the real files, not copies. We were able to route a complex project to several users with just a few mouse clicks once we had set up the group. By controlling access levels, we could specify which users could only review objects and which could edit them.

Objects moving in a work flow must travel in the exact order set by the object designer. The program tracks the progression of the object through the system, so its location can be determined at any time. You can also tell just when a work flow reached someone and if they have examined it. You can also route the same object to several people at the same time, but only one of them may actually have a given file in that folder open.

There is a simpler way to send an object to someone else on the system. The point-to-point method works like e-mail. Just tell the system what to send and where to send it. The object appears in their mail box. You can add a voice message, or place temporary annotations on image files, and examine .PCX and TIFF files with a built-in viewer. (Office.IQ supports a variety of scanners and CAS-style fax boards. Portfolio says wider support will be included in future releases.)

The software installed easily through the Windows-based setup routine. Pri-

When Color Hits The Road...

"The Northgate Notebook Is An Unbeatable Value!"

—Computer Shopper, March, 1993

There are dozens and dozens of notebook computers on the market today. So when our ZXPortable earned a spot on the cover of the March 1993 issue of Computer Shopper, it was quite an honor, indeed.

In case you missed it, here is an encore performance of the review of our exciting ZXPortable Notebook computer. Take a look ...then place your order today. If you aren't completely satisfied with your system, return it within 30 days for a full refund. No questions asked.

Northgate ZXPortable 486SX/25

The ZXPortable 486SX/25, one of two 486-based notebooks in this review,

can be upgraded to a full 486DX CPU. Couple that with its full set of options, the best battery life and relatively low price, and the ZXPortable 486SX/25 stacks up as a value that is hard to beat.

Northgate prices the machine at \$3799, which is quite competitive considering the 486SX CPU powering the unit and everything else that comes standard, including 4MB of RAM, a 120 MB hard disk, a Logitech TrackMan Portable mouse, a fabric carrying case, MS-DOS 5.0, and Windows 3.1.

The ZXPortable uses a Sharp 8.5-inch TFT screen that can display 256 colors at its maximum 640 x 480 resolution. The refresh rate is an acceptable 80ms and the contrast ratio is 60:1. The screen quality is excellent.

The battery life is rated at three hours. While it didn't last that long when running the ZD Labs Battery Rundown test, it did last an average of 2:14:23, the best time among the reviewed notebooks.

No concessions are made to the unit's size or weight in order to boost battery life. The unit measures a trim 2.0 x 11.0 x 8.5-inches and weighs just 6.4 lbs.

The ZXPortable uses a nickel metal hydride battery. The recharge time is a speedy 70 minutes when the notebook computer is off, and 100 minutes when the computer is on. The standard battery-conservation features are available, such as a suspend mode and the ability to cut power to the LCD or hard disk if neither is accessed for a predetermined amount of time.

"The overall value and construction are good, and the battery life is exceptional."

The 86-key keyboard has a solid, responsive touch. It is logically arranged, uses an inverted-T layout for cursor keys and has dedicated PgUp and PgDn keys.

The ZXPortable accepts 16MB of RAM, and the 120MB hard disk is large enough and fast enough (19ms) to handle disk-intensive applications. There is an internal port for a FAX/modem.

A basic docking station (\$599) comes with three ISA slots, two 5.25-inch drive bays, and a 5.25-inch floppy drive. A deluxe docking station (\$999) includes a 14-inch SuperVGA monitor, OmniKey keyboard, and a desktop mouse.

On the service front, Northgate backs the ZXPortable with a one-year parts-and-labor warranty and a 30-day money-back guarantee. Toll-Free technical support is available 24 hours a day, 365 days a year.

The ZXPortable is a machine with many strong points and no significant weaknesses. The overall value and construction are good, and the battery life is exceptional. Best of all, all this value is available at a highly competitive price.

Reprinted from Computer Shopper

Want genuine 486DX/25 power? PC Magazine said... "The Northgate ZXPortable 486DX/25 offered the best bang for the buck!"

March 30, 1993



The optional docking station lets your ZXPortable double as a powerful desktop system.

All Roads Lead To Northgate®!

Now... \$395 value software FREE with ZXPortable!

PackRat
The Complete Information Manager

We've made an unbeatable value even better! For a limited time, we're including PackRat contact and personal information manager with every ZXPortable system. The top-rated software is the ideal companion for your ZXPortable. Best of all, this \$395 value is yours — **FREE!**

Northgate ZXPortable At A Glance

- 486SX/25MHz or 486DX/25MHz processor
- 120MB hard drive (200MB available)
- 4MB RAM (expands to 16MB)
- Active Matrix Color display with 256 simultaneous colors
- 86-key full-travel keyboard
- Nickel metal-hydride battery for up to 3 hours of power (with power management enabled)
- True 8.5" x 11" size
- Weight: 6.4 lbs.
- MS-DOS 6.0 and Windows™ 3.1
- Logitech™ TrackMan Portable mouse
- Fabric carrying case
- FREE \$395 value PackRat PIM/contact management software

ZXPortable 486SX/25\$3599

ZXPortable 486DX/25\$3799

ZXPortable Monochrome System

ZXPortable 486SX/25\$1899

ZXPortable 486DX/25\$2099

Docking Station\$599

Docking Station Bundle with

14" SVGA color monitor, *OmniKey* keyboard, 5.25" floppy drive and desktop mouse.\$999

Call Now To Order
800-453-0126



USA #CGS00K91AGS5193 PS01

Major credit cards, money orders, direct wire and approved company purchase orders accepted

NORTHGATE®
Solutions for Workgroups™

7075 Flying Cloud Drive, Eden Prairie, MN 55344

See Us At
Spring Comdex '93
Booth W7182

© Copyright Northgate Computer Systems, Inc. 1993. All rights reserved. Northgate, ZXPortable and the Northgate 'N' logo are U.S. trademarks or registered U.S. trademarks of Northgate Computer Systems. MS-DOS, Windows and Microsoft are U.S. trademarks or registered U.S. trademarks of Microsoft Corporation. All other products and brand names are U.S. trademarks and registered U.S. trademarks of their respective companies. Prices and specifications subject to change without notice. Prices shown are U.S. dollars and do not include shipping and handling charges or appropriate sales taxes. Northgate reserves the right to substitute components of equal or greater quality or performance. All items subject to availability and offer is valid in the U.S. and Canada only.

■ Digital's TeamLinks

A real team player for the VAX office.

by Steven C. M. Chen

Imagine you're in a VAX shop and you need an e-mail/groupware solution: An easy-to-use software package that includes a flexible e-mail system with WAN connectivity capability, cross-platform potential, forms routing and tracking, conferencing, and other goodies. Well, TeamLinks for Windows, Version 1.1, from Digital Equipment Corp., could be just what you're looking for. But solutions don't always come cheap.

A base TeamLinks system for ten users costs \$5,035. This client/server-based application can run on a PC, but it needs a VAX as its server. On the client side, it requires Windows. Additional clients are \$530 each, and other configurations are available.

We looked at a beta version of TeamLinks, Version 1.1—essentially the same as the current shipping version (1.0A), with the addition of TCP/IP support, greater file conversion abilities, and a faster interface. Because it no longer depends on the DECnet protocol, integration to other networking environments is easier. For example, access to a NetWare file server requires only the addition of ODI drivers and a NetWare shell. Recompiled under Microsoft Visual Basic, Version 2.0, TeamLinks 1.1's interface responds much faster than 1.0A's and requires less memory.

THE BIG PICTURE

TeamLinks' shell, or interface, is known as the Information Manager. It serves as the hub for TeamLinks' two main features—e-mail and forms routing.

Sending mail in TeamLinks is as easy as filling out a form. To speed things up, recipient names can be entered by using just the first few characters, dragging them over from the personal address book, or looking up a new name from the directory service.

You can also set up a distribution list for your regularly scheduled mailings. Multiple files can be attached to mail messages. TeamLinks' filing system stores information in folders and file cabinets. File cabinets can reside on a VAX, your hard disk, or other non-VAX servers.

If you want to send mail outside the system, Digital offers optional gateways for PROFS, SNADS, MCI, and MHS.

TeamLinks' mail features are pretty standard fare and include receipt noti-

forms from the sample applications folders. A utility for designing your own routing forms or modifying an existing one is also included. The process is similar to sending an e-mail. In fact, the form is sent as a mail attachment. Each recipient has a predefined role to fulfill, specified by the initiator and designed into the form. Premade forms can contain these predefined roles that you assign to users from an address database. Both initiators and recipients can check the progress of the form by looking at the tracking report.

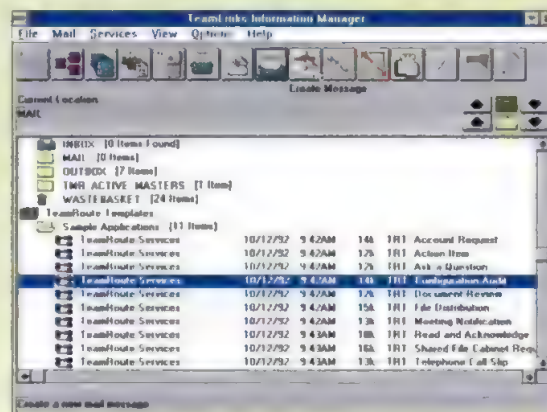
You can use electronic forms even for sensitive forms that require signature approval. TeamLinks uses passwords as electronic signatures. Comments can be added as well. If you disapprove, you can either let the request continue its route or return it to the sender immediately.

Digital also has an optional BBS-like conference module for TeamLinks. You can read, add to, or reply to a specific topic of discussion

with a few simple mouse clicks.

LAUNCH AND RUN

Currently, only WordPerfect for Windows, Version 5.2, has built-in hooks to TeamLinks. But eventually, other Windows-based applications, such as Ami Pro, Lotus 1-2-3, Microsoft Excel, Version 4.0, and Microsoft Word for Windows, will also be able to launch e-mail directly and have direct access to TeamLinks filing cabinets and support its long filenames and folders. These links will be either bundled with the applications or available separately. Other products, such as Network Scheduler 3 for DOS and Windows, from PowerCore, will have a special version that



Routing is easy with TeamLinks for Windows; just pick one of the predefined forms to help start the task.

cations, important-message flags, and reply requests. There are, however, one or two nice extras, such as the inclusion of expiration dates for messages or replies.

CREATE A TRAIL

Have you ever wasted valuable time tracking a routed memo or listening to excuses from the people who "never received it"? That will be a thing of past with TeamLinks. The forms-routing feature, TeamRoute, tracks the movement of files and messages along a predetermined list of recipients and checks the status of any approvals requested.

You start a routing process by selecting 1 of the 11 predefined routing

works with TeamLinks.

Installing the TeamLinks client on a PC is no harder than installing any other Windows application. But if you're setting up TCP/IP for the first time, there are other issues. Each PC must have a unique Internet address—a consideration you'll need to deal with ahead of time. Server installation can be involved, especially if you need to set up everybody's mail address. You will have to enter them one at a time and TeamLinks doesn't offer much help.

For the VAX-less office, TeamLinks may seem like an attractive solution if you can justify the high start-up cost. But don't forget the time it will take to get

*TeamLinks' mail features
are pretty standard fare.
There are, however,
one or two nice extras,
such as the inclusion of
expiration dates for
messages or replies.*

the support staff up and running. You may want to wait until TeamLinks migrates to another platform, such as Microsoft Windows NT, before considering it. □

► FACT FILE

TeamLinks, Version 1.1

Digital Equipment Corp., 146 Main St., Maynard, MA 01754; 800-344-4825, 508-493-5111; fax, 508-493-8780.

List price: For sites with existing VAX servers, \$530 per node. Additional server software may be required. For setup (including MicroVAX 3100 with complete client and server software and license for ten users), \$36,956. Additional configurations available.

Requires: Server: VAX. Workstation: Microsoft Windows 3.x, DEC Pathworks or TCP/IP package.

Circle 468 on reader service card

many files and the database must reside on a server running NetWare, Version 3.11, but you have the option of placing copies of the program file on each node to reduce network overhead. The initial setup automatically creates a list of potential users from the NetWare 3.11 Bindery. Everyone with a network account is given a Root-Level folder.

OFFICE SETUP

It was simple to configure the program as desired, but the organization of the dialog boxes took a bit of getting used to. System administration is simple enough and should not take much time. Figuring out how to access advanced features was slow. The Getting Started Guide lacked adequate illustrations, and the Administrator's Guide and User's Guides were task-oriented in a way that we found somewhat confusing.

Office.IQ offers the right mix of features for basic document management in a group setting, but it still lacks advanced enforcement and full-text search options needed by many organizations. Nevertheless, its combination of desktop and work-flow metaphors is well integrated and provides a good framework for collaborative computing.

Futurus Corp.

Futurus Team DOS/Windows Combo

BY RON ANDERSON

Futurus Team DOS/Windows Combo, from Futurus Corp., is a capable and in-



expensive package that covers the bases of workgroup communications, with some bonuses thrown in. At \$649 for the five-user version, Futurus Team provides DOS and Windows clients with LAN-based e-mail, group scheduling, phone messaging, real-time conferencing ("chatting"), a group contact database, note and card files, and some useful DOS utilities. Of these many goodies,

► FACT FILE

Futurus Team DOS/Windows Combo

Futurus Corp., 211 Perimeter Center Pkwy., #910, Atlanta, GA 30346; 800-327-8296, 404-392-7979; fax, 404-392-9313

List price: For 1 user, \$149; for 5 users, \$649; for 25 users, \$2,495; for 100 users, \$4,995.

Requires: Server: No RAM, 3MB hard disk space. DOS workstation: 640K RAM, VGA video (for fax viewing), DOS 3.1 or later. Windows workstation: 2MB RAM (4MB recommended). Chat module requires a NetBIOS or Novell IPX-based network.

In short: Futurus Team DOS/Windows Combo offers e-mail, scheduling, phone messaging, chatting, and group-based note and card files for both DOS and Windows clients. Though automatic work flow is missing, the performance and features are good for this relatively inexpensive product.

ON READER SERVICE CARD

three—wide area messaging, real-time chatting, and scheduling—cross the mystical border into the land called groupware. Futurus Team makes no provision for automating work flow, however, so if your looking for this feature, you'll need to look elsewhere.

FAMILIAR FACES

In a direct comparison, the DOS client comes out looking stronger than the Windows client, primarily a result of its superior overall integration. While it presents a unified menu structure for accessing Futurus Team's various modules, each Windows module is implemented as a separate program. Your screen becomes very crowded once two or three of these modules are opened simultaneously on the Windows desktop.

The e-mail module is robust. Mail messages, file attachments, and faxes can be sent to local or remote users and groups. Remote LAN users are accessible via optional gateways, including Futurus TEAM WAN, which provides real-time connections across separate Novell LANs (\$695). For cross-platform e-mail exchange, there's Futurus Team MCI Mail Gateway (\$995 for unlimited users) and Futurus Team MHS Gateway (\$995 for unlimited users).

To Every LAN Manager Who Thought Remote Access Was Hard,



U.S. Robotics Just Made It Simple.



See Us At Booth #M6114
COMDEX/Spring '93

Introducing the Shared Access[™] Communication Server 386[™] and LAN modem. Easy, complete solutions from the company that invented "plug it in and forget about it."

For remote users, LAN-based users or both, our new Shared Access products provide complete desktop solutions that give all your users transparent remote access to Novell[™] LANs.

Easy to install, each product includes an Ethernet NIC, an upgradable modem and all the software you need to dial in and dial out. Plus the Comm Server 386 has a dedicated 386 processor.

Easy to support, these are the only products with both remote control and remote node. Switch seamlessly between the two access technologies for unprecedented ease of use!

Today's only full family of products, Shared Access demystifies the remote access problem. And dollar-for-dollar, a Shared Access solution gives customers more value: only \$1695 for the LAN modem and \$1995 for the Comm Server 386. So take the simple way out.

Call 1-800-DIAL-USR.

U.S. Robotics and the USRobotics logo are registered trademarks of U.S. Robotics, Inc. Shared Access and Shared Access Communication Server 386 are trademarks of U.S. Robotics, Inc. All brand or product names are trademarks or registered trademarks of their respective companies.

U.S. Robotics[®]

The Intelligent Choice In Data Communications
CIRCLE 231 ON READER SERVICE CARD

8100 N. McCormick Blvd., Skokie, Illinois, 60076-2999. Tel. 708-982-5010.

Unlike BeyondMail's integrated forms approach, Futurus Team's phone message module is separate from the e-mail module. Phone message forms, similar to the ubiquitous paper forms found in most offices, are quick and easy to complete. A nice feature here is the system-wide frequent-caller database. You can easily add a caller to the database, and Futurus Team's phone message module performs automatic look-ups as you type the caller's name. Phone numbers and company information are filled in automatically when a match is found.

MEETING CITY

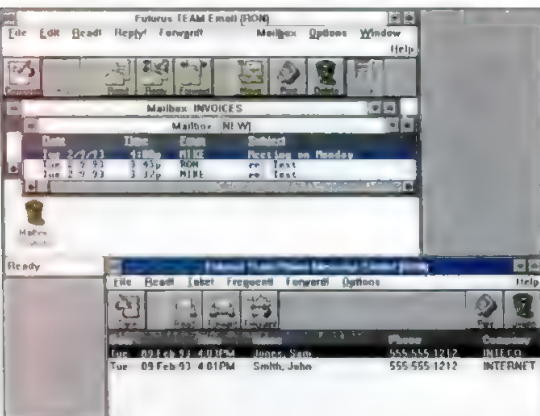
The scheduling module provides individual and group scheduling and a to-do list. When you schedule an event for a group, Futurus Team's scheduling module searches across your selected users' and

WAN can participate in cross-network conferences. This provides at least a shadow of the functionality provided by heavyweight conferencing products such as Ventana Corp.'s GroupSystems 5.

The DOS and Windows clients share the same data files on the server, so switching between them during the day presents no problems. The Windows client does require you to load Futurus Team's DOS TSR program before you start Windows. The DOS TSR memory overhead of 6K to 12K is acceptable for DOS users, but Windows users are unnecessarily inconvenienced by this requirement.

SETTING UP

Futurus Team's installation routine is smooth and well thought out. It automatically creates the necessary directories and copies files to the appropriate places. If you install Futurus Team on a NetWare network, users and groups can be added automatically from the NetWare Bindery. Otherwise, adding users, groups, and resources is a manual process in the DOS-only administration module. If Futurus Team detects that your network is using Novell's Message Handling System (MHS), it offers you the choice of using the system for Futurus Team's mail delivery system. Futurus Team routes mail on its own if MHS



Futurus Team's Windows interface works neatly with its DOS companion, but the Windows desktop can get crowded.

resources' schedules for common blocks of free time. The scheduling module also provides a graphical display of participants' schedules to help you fine-tune your meeting time. Remote MHS users cannot be scheduled in this manner because their schedules are not available to the local network. Those connected via TEAM WAN, however, can be included.

Notification of upcoming group meetings is provided to local users automatically through e-mail. You can keep track of each participant's RSVP status through a graphical display.

Futurus Team's conferencing function enables five people at a time to converse over the network via their keyboards. Users on separate networks connected together with Futurus Team's proprietary

isn't available.

As with all networked messaging products, administrative burdens increase as connections to external gateways proliferate. The administration tools included with Futurus Team are limited but suitable for the small LANs and workgroups for which this product is most appropriate. Futurus Team should not require a large part of any administrator's time and effort.

Futurus Team simplifies and enhances many day-to-day group-oriented communications tasks at a reasonable cost. Sending memos and phone messages, managing personal schedules and to-do lists, and scheduling and confirming group meetings are all areas of your daily work that could benefit from its use. □

PHd

THE World's
SMALLEST WONDER!



- The PHd is a Pocket Hard Disk designed to meet the demand of new technology with user friendly environment. It is considered as one of the most advanced software application portable environment.
- There is a range of four storage capacities from 60 to 200MBytes to suit a wide range of uses and users of data and software.
- The PHd can be easily connected to any parallel port on the PC or Notebook. The PHd driver automatically finds the port and adds the command line to recognise the PHd as the next logical drive. Your software and files are there on screen ready to run.
- Power to the PHd can be supplied either via the keyboard using an adaptor provided, or with portable battery power pack or an optional external AC adaptor.

Available Storage Capacities	60, 80, 120, 200 MB
Average Seek Time	16 msec
Data Transfer Rate	400 KB/sec
Operating Shock	10 G's
Non-Operating Shock	150 G's
Dimensions	148mm x 75mm x 28mm
Weight	350 gms

manufacturer

KT TECHNOLOGY (S) PTE LTD

100E Pasir Panjang Road, KT Building, Singapore 0511
Tel: (65)-4727885 Fax: (65)-4728040 Telex: RS 38155 KITIAN

distributors

Synergy Resource (USA) Inc.

104 Golf Club Drive, Longwood, Florida 32779, USA
Tel: (407)-8696257 Fax: (407)-7886708

Urtec Datalink

129 Telson Road, Markham (Toronto), Ontario, Canada L3R 1E4
Tel: (416)-4150145 Fax: (416)-4759840

KT Technology Europe B.V.

Hastelweg 268, 5652 CN Eindhoven, The Netherlands
Tel: 31 40 571555 Fax: 31 40 572077

CIRCLE 195 ON READER SERVICE CARD

Copying the Volume Label

Handy DOS Help

BY NEIL J. RUBENKING

COPYING THE VOLUME LABEL—REVISITED

The batch program VCOPY.BAT that was published in the August 1992 User-to-User column is, unfortunately, incorrect. If the source floppy disk has the volume label "A B C D E F", which is exactly 11 characters long (six letters plus five spaces), the batch file would copy only the substring "A B C D E" to the destination floppy disk. The program fails in this case since F becomes the tenth batch file parameter, which is not accessed by the program.

To correct the problem, you need to use the DOS SHIFT command in the batch file in order to access the tenth parameter. Moreover, the original program is very inflexible since the source and destination drives cannot be specified at run-

time. Finally, it's always a good idea to use the /V (verify) switch when copying files to a floppy disk.

Figure 1 shows VCOPY2.BAT, a new version of the program that takes care of all of these problems, including allowing users to copy from a source drive %1 to a destination drive %2 (VCOPY2 B: A:, for example).

Note that if the source floppy disk is not labeled and the destination floppy disk is labeled, the destination disk will retain its label. This shouldn't cause any problems.

*Victor G. Alter
Buffalo, New York*

► **PC MAGAZINE:** I may be able to leap tall DOS commands with a single keystroke,

► IN THIS SECTION

Tutor 307
Lab Notes 313
Utilities 335
Environments 347
Power Programming 359
Solutions 364

but sometimes I just can't count! Quite a few readers wrote to point out that the original VCOPY.BAT could handle labels containing *four* spaces, not five. A simple call to the SHIFT command brings the tenth parameter within reach, allowing VCOPY2.BAT to copy a volume label with the maximum possible number of spaces.

I added a few lines to VCOPY2.BAT to validate the two new command line parameters, allowing only drives A: and B:. If your system has more than two floppy disk drives, simply add their letter designations, both upper and lowercase, to the two FOR loops near the beginning of the batch file.

Note, too, that VCOPY2.BAT still can't correctly copy labels that contain a series of spaces. Any number of adjacent spaces in the original label will be reduced to a single space on the copy. For example, letting the underscore represent a space, the label FOO____BAR would become FOO_BAR.

The corrected version of the batch program—VCOPY2.BAT—is available for downloading from the Utilities/Tips Forum on PC MagNet.

VCOPY2.BAT

Complete Listing

```
@ECHO OFF
::Purpose: Copy all files and the volume label from drive %1 to drive %2
FOR %%v IN (a: A: b: B:) DO IF '%1'=='%%v' GOTO Ok1
GOTO Syntax
:Ok1
FOR %%v IN (a: A: b: B:) DO IF '%2'=='%%v' GOTO Ok2
GOTO Syntax
:Ok2
XCOPY %1\ %2\ /s /e /v
ECHO @echo off> volume.bat
ECHO if '%4'=='has' goto end>> volume.bat
ECHO shift>> volume.bat
ECHO label %2%%4 %%5 %%6 %%7 %%8 %%9>> volume.bat
ECHO :end>> volume.bat
VOL %1
VOL %1|FIND "drive"> VCOPY_GO.BAT
CALL VCOPY_GO
VOL %2
DEL VOLUME.BAT
DEL VCOPY_GO.BAT
GOTO End
:Syntax
ECHO SYNTAX: VCOPY2 d1: d2:
ECHO     where d1 and d2 are floppy drive letters
:End
```

Figure 1: This corrected version of VCOPY.BAT copies one floppy disk to a possibly different-size floppy disk, label and all.



HANDY DOS HELP

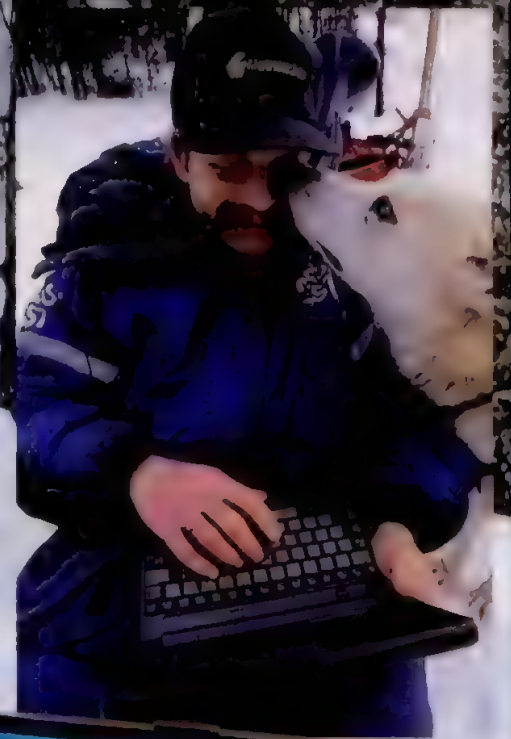
I wrote a little batch program, named HELPRINT.BAT, that lets you easily create a personal DOS command refer-

Leader Of The Pack

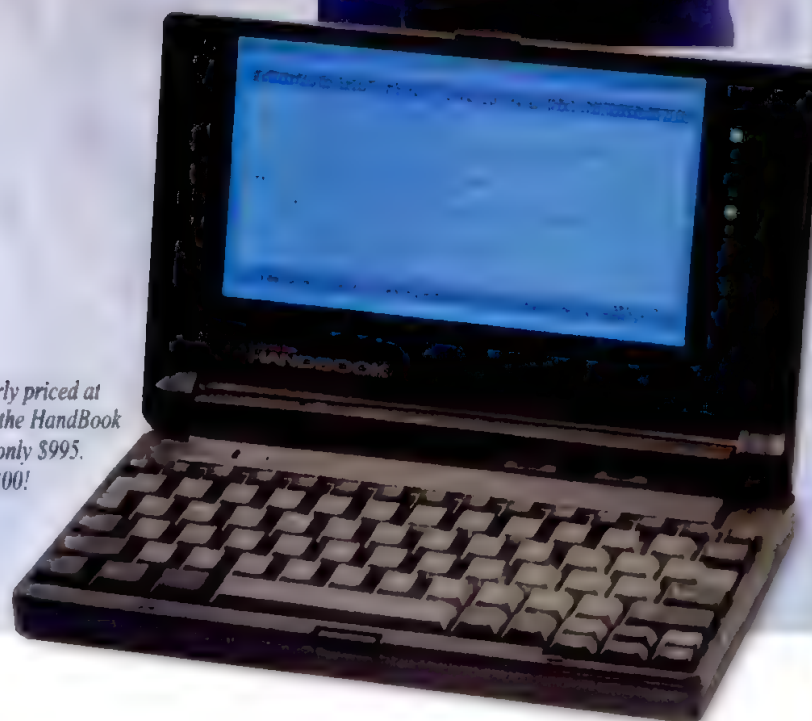




*Frank Teasley,
1991 winner of the
Iditarod's
Humanitarian
Award for the best
cared-for team, used
his Gateway 2000
HandBook
throughout the race
to keep records on
his dogs and race
progress.*



*Regularly priced at
\$1295, the HandBook
is now only \$995.
Save \$300!*



Go The Distance!

Frank said the HandBook's exclusive auto-resume feature was a big plus, too. Being able to open the HandBook and start working exactly where he left off made it effortless to use.

Although the dogs slept an average of 12 hours a day during the race, Frank was lucky to sleep 45 minutes daily. He was busy making straw beds, putting ointment on the dogs' feet, replacing their polar fleece booties, preparing their food, repairing harnesses and repacking while the dogs rested. "Sleep deprivation can be hazardous to a musher's ability to focus on details. The HandBook kept me on top of my schedule so I could concentrate on the dogs and they could concentrate on what they love best: the race."

Frank concluded, "There's not another computer small enough or powerful enough to come through for us the way the HandBook did."

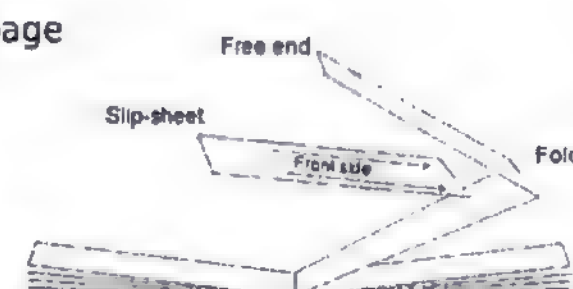
It's a PC that's the perfect companion in even the most demanding situations, even if you never leave your office. Get the leader of the pack: Gateway 2000's HandBook!



8 0 0 - 8 4 6 - 2 0 6 3

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Inverted Foldout slip-sheet



GbsSlipSheet-001

Folded edge of the page

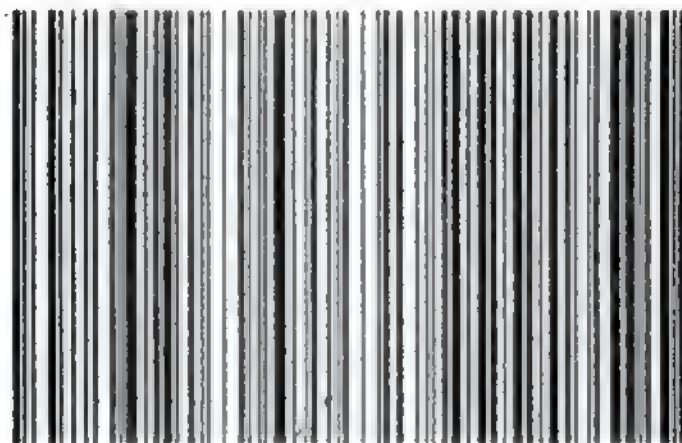
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-001B

Back

1. Follow instructions on the other side



Gateway's HandBook Is The First Portable To

On March 6, 1993, 68 men and women, 1,253 dogs and one portable computer left the starting line in the 21st running of the Iditarod dogsled marathon. Not all of the men, women and dogs made it through nearly 1,100 miles of blinding snow, howling wind, mountainous terrain and sub-zero temperatures – but the PC did!

It was the first time anyone ever took a portable all the way from Anchorage to Nome on a dogsled. Appropriately, the first portable PC to go the distance was the first product in an entirely new category of portables; the unique and innovative product that defined new standards for portable PCs: the HandBook, pioneered by Gateway 2000. At just 2.75 pounds, measuring

only 6 x 10 inches yet including a 40MB hard drive, a backlit, use-it-anywhere screen and comfortable keyboard, the HandBook was the only choice for Iditarod musher Frank Teasley.

"I've always wanted a way to carry my racing strategy with me and to record my progress during the race," said Frank. "But I can't afford any extra weight on the dogsled, and you don't find many electrical outlets on the trail. The HandBook easily fit in the dogsled, and I used it at checkpoints to review details of the trail ahead, information on my competition, and notes on my dogs." Because he couldn't recharge batteries on the trail, Frank ran his HandBook on AA batteries kept warm in his parka.

The Perfect Companion!

The Gateway 2000 HandBook®

- Weight: 2.75 lbs. (includes battery)
- Dimensions: 5.9" x 9.75" x 1.4"
- AC adapter/charger measuring
- NiMH 2.3Ah battery; approximately 4.5 hrs. battery life with power management
- Alkaline battery pack; (AA batteries not included)
- C & T processor, 286-class performance
- 1MB RAM, upgradeable to 3MB
- 40MB hard drive
- Backlit 7.6" double-scan 640 x 400 resolution screen
- 1 parallel and 1 serial port
- 78-key keyboard; 101-key emulation, inverted-T cursor pad
- Microsoft® MS-DOS® 5.0, Interlink and your choice of WordPerfect® for DOS 5.1 or Microsoft Works™ for DOS 2.0
- Serial download cable

\$995



Popular Science
BEST OF WHAT'S NEW



HandBook Options

- 2400bps data/9600bps send-and-receive fax/modem with software, \$165
- Citizen PN48 portable printer, \$380
- Extra AC adapter, \$75
- Extra 2.3Ah batteries (each), \$70
- RAM upgrade to 3MB, \$130
- Combo unit (1.44MB 3.5" external floppy drive with 1 parallel and 1 serial port), \$265
- Extended VIP warranty (24-hour factory service turnaround), \$100 (must be purchased at the time of sale)



8 0 0 - 8 4 6 - 2 0 6 3

610 Gateway Drive • P.O. Box 2000 • North Sioux City, S.D. 57049-2000 • 605-232-2000 • Fax 605-232-2023

Sales Hours: 7am-10pm Weekdays, 9am-4pm Saturdays (CT)

©1993 Gateway 2000, Inc. HandBook, "G" logo design and "You've got a friend in the business." slogan are trademarks of Gateway 2000, Inc. All other brands and product names are trademarks or registered trademarks of their respective companies. Prices and configurations are subject to change without notice. Prices do not include shipping.

HELPRINT.BAT

Complete Listing

```

@ECHO OFF
REM HELPRINT.BAT - Prints the output of the DOS 5.0 HELP command.
REM Put a filename on the command line to print to file.
IF '%1'=='{P}' GOTO ProcessOne
SET HelpOut=PRN
SET HelpSep=.
IF NOT '%1'=='' GOTO FileOutput
ECHO Make sure the printer is on line then
PAUSE
GOTO PrintIt
:FileOutput
SET HelpOut=%1
REM ^L in next line is Ctrl-L
SET HelpSep= ?
:PrintIt
ECHO Now printing condensed help information about all commands ...
HELP > %HelpOut%
ECHO%HelpSep% >> %HelpOut%
FOR %v IN (BREAK CALL CD CHCP CLS COPY CTTY DATE DEL DIR ECHO EXIT FOR GOTO IF) DO CALL %0 {P} %v internal
FOR %v IN (LH MD PATH PAUSE PROMPT RD REN SET SHIFT TIME TYPE VER VERIFY VOL) DO CALL %0 {P} %v internal
FOR %v IN (APPEND ASSIGN ATTRIB BACKUP CHKDSK COMMAND COMP DEBUG DISKCOMP) DO CALL %0 {P} %v external
FOR %v IN (DISKCOPY DOSKEY DOSSHELL EDIT EDLIN EMM386 ERASE EXE2BIN EXPAND FASTOPEN) DO CALL %0 {P} %v external
FOR %v IN (FC FDISK FIND FORMAT GRAFTABL GRAPHICS HELP JOIN KEYB LABEL LOADFIX) DO CALL %0 {P} %v external
FOR %v IN (MEM MIRROR MODE MORE NLSFUNC PRINT QBASIC RECOVER REPLACE RESTORE) DO CALL %0 {P} %v external
FOR %v IN (SETVER SHARE SORT SUBST SYS TREE UNDELETE UNFORMAT XCOPY) DO CALL %0 {P} %v external
SET HelpOut=
SET HelpSep=
GOTO End

:ProcessOne
ECHO Now printing help information about %3 command %2
ECHO Detailed help information about %3 command %2 >> %HelpOut%
ECHO *****
ECHO *****>> %HelpOut%
help %2 >> %HelpOut%
ECHO *****
ECHO *****>> %HelpOut%
ECHO%HelpSep% >> %HelpOut%

:End

```



Figure 2: HELPRINT makes use of a "batch file subroutine" to print the help information for all of the internal and external DOS commands. Its output is alphabetized and can be directed to either a printer or to a file. It disregards all executables that are not DOS commands.

ence. Of course it doesn't replace the entire DOS reference manual! To use HELPRINT, all you have to do is to put your printer on-line and type HELPRINT at the DOS prompt.

*Fitzgerald Jean
Port-au-Prince, Haiti*

► **PC MAGAZINE:** DOS 5.0 introduced a consistent help standard for DOS commands. Every command, whether internal or external, responds to the command line switch /? by printing a short help text. Passing the command name to the HELP command has the same effect, and calling HELP with no parameters prints a list of all the commands for which help is available, along with a brief description of each one.

The original HELPRINT batch file used a pair of FOR commands to pass the 30-odd internal command names to

HELP, in alphabetical order. Then it used another FOR command to execute every .COM and .EXE program in the DOS directory with a command line parameter of /?. If the DOS directory contained any non-DOS utilities, HELPRINT would execute them, with unpredictable results. Also, the list of external commands came out in no particular order.

To avoid these two problems, I rewrote HELPRINT.BAT; you can see the result in Figure 2. This version simply adds several more FOR lines containing the names of the external commands. Now the output is alphabetized, and no non-DOS utilities get executed accidentally. I also added the ability to print to a file instead of to the printer. If you specify an output file on the command line, HELPRINT will store the help information to that file, adding a form-

feed between each topic.

To process each command name, HELPRINT.BAT uses a kind of batch file subroutine. The seven FOR loops re-execute HELPRINT.BAT itself, passing the string {P} as the first parameter, the command name as the second, and the word *internal* or *external* as the third. The first IF test in the batch file jumps to the label ProcessOne if the first parameter is {P}. Batch file lines at this label do the actual recording of the HELP information.

You can download the very handy HELPRINT.BAT from the Utilities/Tips Forum on PC MagNet, archived as HELPRI.BAT. □

Share your latest DOS and system discoveries through User-to-User. See the "How to Contact Us" sidebar in the Solutions column.

26 PEOPLE 6 PLATFORMS 1 SIMPLE SOLUTION



Introducing the LANtastic® 5.0 Network.

Simple solution: the LANtastic 5.0 network.

Simple, because we like your office just the way it is. A LANtastic 5.0 network connects all x86 platforms—from the XT's to Mike's coveted 486. And with its built-in connectivity, you can share resources and data across DOS, Windows, NetWare® and OS/2®—even Macintosh® and TCP/IP with optional products

Simple because, well, it's a steal. The LANtastic 5.0 starter kit includes everything you need to network two PCs—plus support for up to

Accounting has XT's and AT's with DOS. Management's running Windows.™ Mike's on the 486 (lucky dog). And you're on edge wondering how all 26 can share files, the CD-ROM and just 2 printers. Lucky for you, there's one

500 licensed users. You'll get the fifth edition of Artisoft's award-winning LANtastic product. Free technical support and a 30-day money-back guarantee. Reliable, high performance. E-mail. File-level security. And a new Scrapbook feature that lets

Windows users share text, graphics and sound

So no matter how different your office machines may be, the LANtastic 5.0

network lets everyone share and share alike. (You too, Mike.) And that makes for one simple solution

For more information about the LANtastic 5.0 system or to order an upgrade, see your Artisoft Authorized Five Star™ Reseller today or call 1-800-846-9726, ext. 600.

LAN Times
Readers Choice '91-'92
LAN Magazine
Product of the Year '91-'93
PC Magazine
Editors' Choice '89-'92

 **ARTISOFT®**

CIRCLE 254 ON READER SERVICE CARD

© 1991 ARTISOFT, INC. All rights reserved. Artisoft and LANtastic are registered trademarks and Artisoft Authorized Five Star is a service mark of Artisoft, Inc. Macintosh is a registered trademark of Apple Computers, Inc. All other products are trademarks of their respective holders.

Deleting and Undeleting Files From Your Disk

BY JEFF PROSISE

Have you ever stopped and wondered how it is that DOS can undelete an erased file? Peter Norton discovered the secret years ago and parlayed his knowledge into a fortune with The Norton Utilities' famous UnErase program. UnErase was the first of its kind, and it spawned many imitators. Fortunately, you don't have to buy a third-party undelete utility if you use DOS 5.0 or 6.0, because both have an UNDELETE command built in.

The art of undeleting files may seem like magic to the uninitiated, but it's actually quite simple when you understand how DOS stores files on-disk and what it does when it deletes them. Here, then, is a behind-the-scenes description of how files are deleted and how they can be undeleted. After reading this, you should have a better understanding of the finer points of DOS file management.

DISK STORAGE BASICS If you're unfamiliar with the concept of the file allocation table (FAT) and the way DOS stores files on a disk, it may be helpful to review last issue's Tutor column. Recall that sectors in the data area of a disk—the part of the disk that DOS uses for file storage—are grouped together into units called *allocation units*, or *clusters*. Depending on the size of the disk, a cluster is typically 1, 2, 4, or 8 sectors in length. Logical volumes greater than 256MB use even larger cluster sizes. A 2GB logical volume uses 64 sectors per cluster, resulting in a 32K cluster size.

The FAT, which contains one 12- or 16-bit entry for each cluster on the disk, keeps a record of which clusters are used and which ones are free. A FAT entry of 0 means the corresponding cluster is free. A nonzero value means it contains

file data. If the entry falls within the range (F)FF0h to (F)FF7h (the digits in parentheses apply to 16-bit FATs only), then one or more of the sectors in the cluster is defective and the cluster should not be used for storage. Clusters (and FAT entries) are numbered sequentially, beginning with the number 2. The number of the final cluster is equal to the total number of clusters on the disk, plus 1.

When DOS creates a new file, it starts by creating a 32-byte directory entry that contains information about the file, such as its name, length, and the time and date it was created. The directory entry also includes a record of the file's *starting cluster*—the number of the first cluster used to store the file's information. Next,

*If you understand
how DOS stores and
deletes files on disks,
you'll realize that
undeleting files isn't
pure magic after all.*

beginning with the FAT entry whose number is the same as that of the starting cluster, DOS fills in entries in the FAT in order to create a record of where the file is stored.

An example will help you picture this in your mind. Suppose that a file requires four clusters of storage space, and that clusters 10, 11, 12, and 13 are the first four available. DOS copies the file data to clusters 10 through 13 and then sets the starting cluster field in the file's directory entry to 10. Then it writes an 11 to FAT entry number 10, a 12 to FAT entry num-

ber 11, and either FFFFh (16-bit FATs) or FFFh (12-bit FATs) to FAT entry number 13. FFFFh and FFFh are special FAT entries that signify the end of a chain. When it is asked to read this file, DOS obtains the starting cluster number from the file's directory and then follows the linked list of allocation entries through the FAT until it reaches the end-of-chain marker. The chain of allocation entries for this file is illustrated schematically in Figure 1.

DELETING AND UNDELETING THE FILE Now suppose you ask DOS to delete the file. It's reasonable to guess that DOS might erase the file's directory entry and all the information pertaining to the file in the FAT. It could even erase the clusters where the file itself is stored.

In fact, DOS does little of the above. To erase a file, DOS first goes to the file's directory entry and overwrites the first character in the filename with the value E5h. Then it writes zeros to the file's FAT entries, erasing the record of where the file was stored. Significantly, all the characters in the filename except the first are left intact. The remainder of the directory entry is left intact, too, including the file's size and starting cluster number. More importantly, the file itself is still intact in the data area of the disk. Have you ever noticed that it doesn't take DOS any longer to delete a very large file than it does to delete a very small one? That's because the information contained in the file is not erased. There's really no need to erase it, because now that the clusters are marked free, they will be filled with new data when a new file is created or an existing file is lengthened. Figure 2 shows what the FAT looks like after the file is deleted.

The classic method for undeleting a file involves scanning a disk's directory entries for a filename whose first charac-

How DOS Stores a File

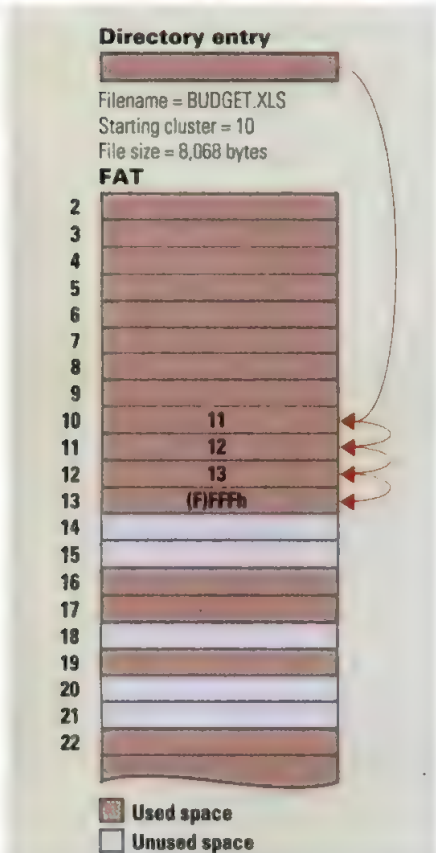


Figure 1: To record a file's location on-disk, DOS places the starting cluster number in the file's directory entry, and then creates a linked list of allocation entries in the FAT. The final cluster in the chain is marked with the value FFFFh in 16-bit FATs, FFFh in 12-bit FATs.

ter is E5h and whose remaining characters match the ones that are specified by the user. For example, in order to locate the directory entry for an erased file whose name is BUDGET.XLS, search for the characters <E5h>UDGET.XLS. Once the directory entry is located, the file's starting cluster number can be obtained from the directory entry. In addition, the number of clusters that the file consumed can be computed by dividing the file size (in bytes) by the number of bytes per cluster.

We now have in hand the key pieces of information needed to undelete the file: the directory entry, the starting cluster number, and a cluster count. We can undelete the file by replacing the first character in the filename (undelete programs typically ask the user to supply the

missing character) and then restoring the file's FAT entries, beginning with the starting cluster number obtained from the directory entry. When this has been done, the file will once again look just like it did in Figure 1.

Obviously, this can't work if another file has claimed the clusters that were occupied by the deleted file. That's why it's important to undelete a file as soon as possible after deleting it. The longer you wait, the greater the chance that DOS will have reused the space occupied by the deleted file, and the less likely you'll be able to recover it.

Even if the space occupied by the deleted file is still free, this method of undeleting is not 100 percent effective. Its greatest weakness is that it assumes that the deleted file was stored in contiguous, sequentially numbered clusters. In our example, the starting cluster number (which was determined from the directory entry) was 10, and the number of clusters that the file occupied (determined by dividing the file size obtained from the directory entry by the length of one cluster) was 4. Since clusters 10, 11, 12, and 13 were all free, it was reasonable to guess that all four clusters once belonged to the deleted file. But what if the file had been fragmented? What if it had been stored in, say, clusters 10, 11, 156, and 157? Had this been the case, undeleting might have been impossible because there's no reliable way the undelete program can pick out clusters 156 and 157 from the hundreds—perhaps thousands—of other free clusters on the disk. This is one more good reason to defragment the files on your hard disk on a regular basis. Defragmented files occupy sequential clusters and are therefore more easily undeleted!

DELETE TRACKING To make up for this weakness in the "classic" form of undeleting, DOS 5.0 and 6.0 offer an additional form of delete protection called *delete tracking*. Delete tracking is activated with the MIRROR command in DOS 5.0 (for example, MIRROR /TC activates delete tracking for drive C:) and with the UNDELETE command in DOS 6.0 (for example, UNDELETE /TC). When delete tracking is active, DOS pauses whenever a file is deleted and copies information about the file—including

a list of the clusters it occupies—to a hidden file called a *delete-tracking file*. If you later decide to undelete the file, DOS uses information in the delete-tracking file to determine which clusters the file occupied. This takes the guesswork out of restoring the record of the file in the FAT. It even lets DOS restore the first character in the filename without prompting you for it, because the original filename is stored in the delete-tracking file along with the information about the file's location.

Even delete tracking isn't perfect, however. It works fine as long as the space occupied by an erased file is still unused, but it's powerless to help if another file has come along and claimed that space for itself. Therefore it's still im-

When a File Is Deleted

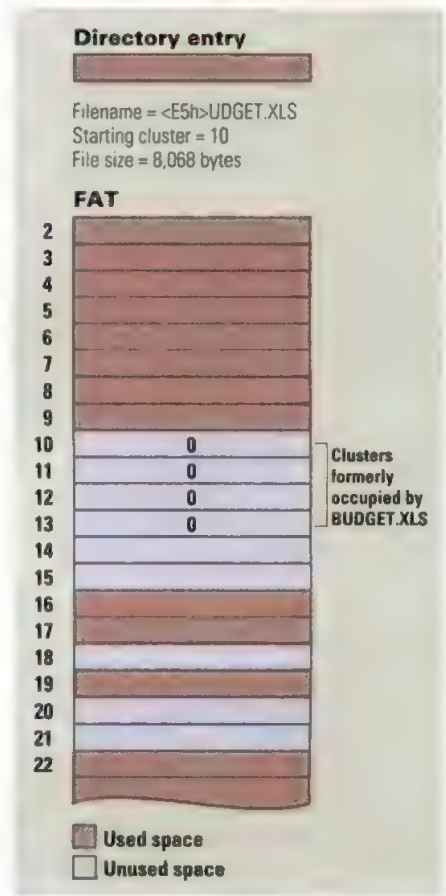


Figure 2: To delete a file, DOS overwrites the first character in the filename with the value E5h and zeros out the FAT entries that correspond to the file. Much of the information needed to undelete the file—the starting cluster number, the record of the file's size, and the contents of the clusters in which the file is stored—remains intact.

WHEN IT COMES TO 486 POWER AND PERFORMANCE, THE CALL IS EASY.

—ALTIMA ACCESSORY PACKAGE—

As part of a special, limited-time offer, Altima brings you two notebook-enhancing software packages and a custom carrying case—a \$367 total value—for only \$99. For this one-time, ultra-low price, you'll receive Dashboard™ for Windows, an

award-winning, push-button utility that makes Windows operation even faster. LapLink Pro™, a leading notebook connectivity software program, and a genuine leather carrying case that allows you to transport your Altima notebook in style.



—ALTIMA NOTEBOOKS—

Delivering cutting-edge features at a price the competition can't touch, Altima 486 Series notebooks provide the ultimate in power and performance and include the breakthrough 433C, a 33-megahertz, active-matrix color notebook that combines a 256-color display with Intel's powerhouse 80486DX processor, and the 466, a full-function notebook with a blistering 66-megahertz clock speed. Our 486 Series notebooks are enhanced by features and options such as internal hard drives up to 200 MB, 84-key working surfaces, Windows® software, a 14,400-bps internal fax modem, an integrated trackball and a desktop expansion station, all combined in a sleek, super-sturdy package.

—FREE! CELLULAR PHONE—

Nothing complements mobile computing power better than a transportable cellular phone, which can be yours for free (see details below). When you purchase an Altima notebook and accessory package, you'll receive a certificate for an Audiovox PRO-95. This great phone features a small, light-weight transceiver, 50-number memory, 15-digit numeric display, linked dialing presets, automatic redial and many other innovative features.

For a limited time only*, when you buy any of the Altima 486 Series notebooks and the accompanying accessory package, you will receive a certificate that can be redeemed for a free Audiovox PRO-95 transportable cellular phone—a \$499 value. In itself, the Altima accessory package is a great deal—providing nearly \$400 of software and accessories for only \$99—but combined with a free phone, this offer is unbeatable.

CALL 1-800-356-9990

©1993 Altima Systems, Inc. • 1390 Willow Pass Road, Concord, California 94520 • Tel 510-356-5600 Fax 510-356-2408
The Intel Inside Logo is a registered trademark of Intel Corporation. Windows is a registered trademark of Microsoft Corporation. Dashboard is a trademark of Hewlett-Packard. LapLink Pro is a registered trademark of Traveling Software. All other trademarks mentioned herein are the property of their respective companies. Promotional Accessory Package does not include retail software boxes. LapLink Pro includes serial cable only.*Offer valid through July 31, 1993. Some restrictions apply.CIRCLE 227 ON READER SERVICE CARD

portant to undelete a file as soon as possible after deleting it.

When you undelete a file with DOS 5.0's UNDELETE command, DOS first attempts to restore the file, using delete tracking. If there is no delete-tracking file, or if there one is but it contains no record of the deleted file (to keep the delete-tracking file from growing so large that it monopolizes disk space, DOS limits its size and purges records of old files to make room for new ones), DOS resorts to the classic method of undeleting. Your DOS manual calls this a *DOS undelete*. DOS 6.0 behaves the same way, but before it tries either method of undeleting, it checks to see if you activated a third and more effective form of delete protection, called *sentry undelete*.

SENTRY UNDELETE Sentry undelete is the most effective of the three forms of delete protection. In DOS 6.0, the command UNDELETE /SC activates sentry protection for the C: drive; parameters governing sentry delete's operation (such as whether it will protect files whose archive bits are set) are stored in the text

file UNDELETE.INI, stored in the DOS directory of your hard disk. When you choose sentry undelete, DOS 6.0 creates a hidden subdirectory on your hard disk, named SENTRY. When you attempt to delete a file, DOS moves the file to the SENTRY directory, where it can easily be recovered by moving it back to the original directory. Since the record of the file is never removed from the FAT, you don't have to worry about other files reclaiming the space used by the "deleted" file. To keep the SENTRY directory from growing uncontrollably, DOS occasionally purges it—throws out old files—to make room for more files. The only time sentry undelete will fail you, then, is when the file you want to restore has been purged. (Note: Sentry undelete will also fail if the directory the file was stored in no longer exists.) As usual, the sooner you attempt to undelete a file after deleting it, the better.

Now that you understand how undeleting works, you can see that it isn't so magical after all. It's surprising that DOS wasn't endowed with its own undelete

utility until Version 5.0, because the DEL command was designed from day one to enable deleted files to be undeleted. It's even more surprising that Microsoft didn't write the UNDELETE command itself, but instead licensed it from Central Point Software.

You can also see why merely deleting a file does not ensure that the information in it can't be recovered. That's why some government installations require that employees use Norton's WipeFile or a similar utility to dispose of files containing sensitive data. WipeFile erases all traces of a file. It even destroys the contents of the clusters where the file was stored, optionally overwriting their contents several times with alternating bit patterns to ensure that the data can't be recovered with sophisticated electronic equipment that is sensitive to very low voltage fluctuations.

DOS doesn't provide an equivalent to WipeFile, but if you're a programmer armed with the knowledge of how DOS stores files on disks, it's not difficult to create one. □

6 Reasons to Buy DOS 6 from The PC Zone

- ❖ **Money Back Guarantee**
If you're not satisfied, we'll refund your money
- ❖ **FREE WindowsUser Subscription**
6 months, Free. (New subscribers only)
- ❖ **DOS 6 Advisory Disk**
Receive a 3.5" disk chock full of information & tips.
- ❖ **We're DOS 6 Experts**
If you have questions, just call us.
- ❖ **Exclusive Fuji Bonus**
Receive a rebate and a FREE calculator.
- ❖ **FREE Shipping**
When you buy DOS6 and any other product.

MS-DOS 6 Upgrade

It's the best version of MS-DOS yet, and buying at The PC Zone price, it's the best value too! The MS-DOS 6 Upgrade is the easiest way to double your hard disk. It offers features that protect your data and free up more memory for your MS-DOS-based applications. And integration of MS-DOS 6 with the Microsoft Windows operating system means the Upgrade is a must-have for Windows users.

D #12150 (DOS 6.0 Upgrade 3 Pak)	\$99
D #12226 MS DOS 6.0 - 3.25" disk	\$39
D #12149 MS DOS 6.0 Upgrade MLP	\$38



Free 1997 1994 1994 1994
So Call Now
Mention Code #30604

1-800-258-8088

CIRCLE 199 ON READER SERVICE CARD

U.S. SAVINGS BONDS FOR EDUCATION GROW ALMOST AS FAST AS KIDS DO.

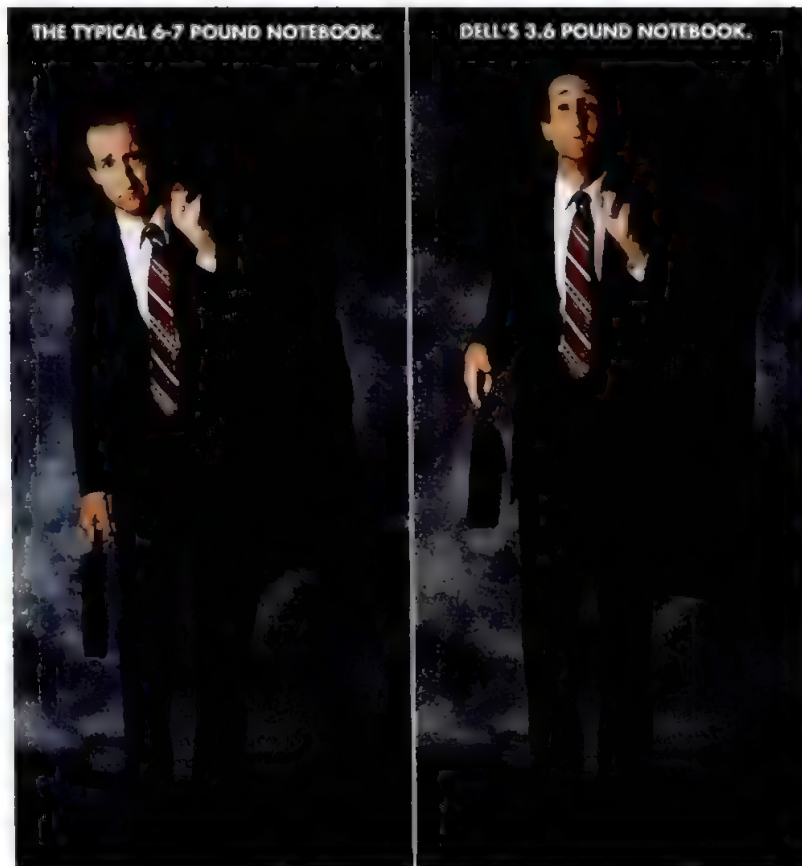
Buy U.S. Savings Bonds — for half their face value — where you work or bank. If you keep them five years or more, you'll earn competitive, market-based rates or a guaranteed minimum rate, whichever is higher.

For current rate information, call
1-800-4US BOND • 1-800-487-2663



A public service of this magazine

LOSE UP TO 3 POUNDS OVERNIGHT.



What most people call a notebook, we call obese. The NEW Dell® 325SLi weighs 3.6 lbs. and is a scant 7 3/4" x 11", and 1 1/4" thick. Our competitors' notebooks weigh nearly twice as much, and they don't even bother trying to hide it.



The notebook's smaller, not the keyboard. The 325SLi has a full 85-key keyboard with special screen navigation keys, and a built-in keyboard mouse.



\$1,499

BUSINESS LEASE: \$55/MONTH

This small number gets you all these big numbers: 25MHz i386™ SL processor, 2MB of RAM, 60MB hard drive, 16KB cache, VGA Reflective (9.5", 640 x 480) LCD, external 3.5" diskette drive, and up to 4 hours of work from the NiMH battery. Not to mention MS-DOS®, Windows, and a mouse. And if you're really hungry for power, we can custom configure a system for you with up to 10MB RAM and 200MB hard drive.

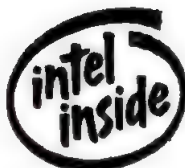


DELL™

800-545-9693

WHEN CALLING, PLEASE REFERENCE #11BFF

HOURS: 7AM-9PM CT MON-FRI, 8AM-4PM CT SAT, 10AM-3PM CT SUN.
IN CANADA,* CALL 800-668-3021. IN MEXICO CITY,* 228-7811.



*Prices valid in U.S. only. Some products and promotions not available in Canada or Mexico. No other discounts apply. *Leasing arranged by Leasing Group, Inc. Intel and the Intel Inside logo are registered trademarks and i386 is a trademark of Intel Corporation. MS-DOS is a registered trademark of Microsoft Corporation. Dell disclaims proprietary interest in the marks and names of others. ©1993 Dell Computer Corporation. All rights reserved.

SOFT KARAOKE™

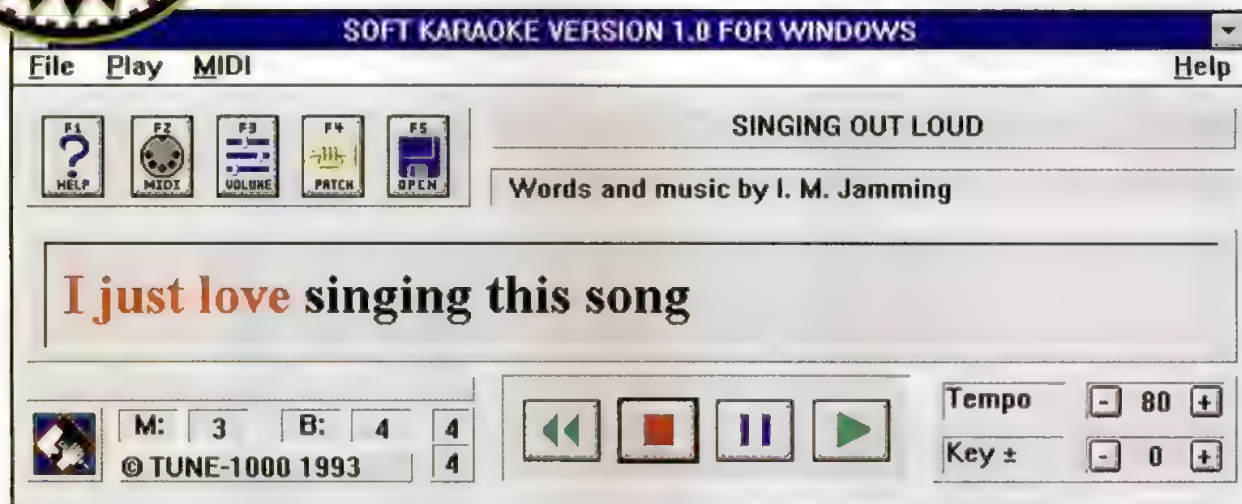


For Windows...



Out of the Shower, into your PC

Step right up! Get on the mike! Turn your PC's sound board into a full-fledged home karaoke! Take advantage of this jam-packed introductory offer and get yourself the most complete karaoke ever to be produced!



The best Karaoke experience

Lyrics appear verse by verse and light up to the right beat. Simple commands allow you to enjoy karaoke fun like never before. You can select your favorite song, change any or all of the musical instruments, and adjust the volume of individual tracks. Do you have a hard time hitting those high notes? No problem... just lower the pitch to match your range! Is the song too fast for you to keep up? Slow it down! **SOFT KARAOKE** brand software is the first and only karaoke that allows you to set the pitch and speed of the music to your liking! Great for parties as you entertain your friends (or let them entertain you) by singing all the greatest hits. You might even ask your boss to sing along at a "Happy Hour" office party (at the end of the evening)! With the mike in your hands and the words on the screen, you'll be all set for the newest entertainment experience on PC!

All kinds of songs, All kinds of stars

SOFT KARAOKE brand software plays **SOFT KARAOKE LP's** which include songs made famous by stars like Elton John and Madonna. All songs come in **MIDI KARAOKE** file format and respect their original orchestrations. Whatever your tastes are, there's a **SOFT KARAOKE LP** for you!

Just what your Sound Board was designed for

Finally, a multimedia product that uses your Soundblaster, AdLib, or other popular sound board to its full extent whether it is a Wavetable lookup or FM synthesis type.

Compatible with your own Sound Software

Use your Windows sound software to mix in your voice, mute out the melody, and even record your own performances!



As if the **SOFT KARAOKE** brand software wasn't enough on its own, you'll also receive a fabulous **SOFT KARAOKE LP** absolutely free! Take advantage of this unbelievable offer while you can. All **SOFT KARAOKE LP** songs come in **MIDI KARAOKE** file format.

Act quickly and get a sleek microphone with your **SOFT KARAOKE** brand software! Designed to plug into your sound board, it will come in handy for your singing and other multimedia needs. Hurry! Offer is available while supplies last!



Call toll-free 1-800-363-TUNE

1-800-363-8863



SOFT KARAOKE, **MIDI KARAOKE** and **TUNE 1000** are trademarks of **THE UNIVERSAL NETWORK OF ENTERTAINMENT**. Other names are trademarks of their respective owners.

TUNE 1000, 7710 Hamel Blvd. West, Ste-Foy, Quebec, Canada G2G 2J5, Tel: (418)-877-8900, Fax: (418)-877-9994

CIRCLE 091 ON READER SERVICE CARD

THE
UNIVERSAL
NETWORK OF
ENTERTAINMENT

TUNE
1000

Creating Hidden Credit Screens In Windows Programs

BY DANNY THORPE

W

hy do professional applications sometimes contain elaborate, hidden windows with silly animations and self-congratulatory messages? And if they're there, why are such credits so very hard to

find? These questions have recently stirred quite a debate in various computer publications. "Imagine how much disk space this nonsense takes up!" protest the letters to the editor. "The time spent to write this fluff could have been better used to code new features or fix bugs!" scold the editorials.

As a Windows programmer, I was originally rather surprised by the outcry and have since been a little amused by the media frenzy. Granted, some of the credit screens—bitmapped photos of the whole development team, for example—do seem a bit too self-indulgent and costly. But the vast majority of such hidden screens requires neither a lot of code nor a lot of time to write. When properly done, an interesting—even entertaining—credit screen will have negligible impact on the size of the program in which it's embedded.

To prove the above claim, this article will show you how to write your own hidden credit screens in Windows programs using a flexible and reusable object. The sample programs in this article—one each in Borland Pascal 7.0 and Borland C++ 3.1—will demonstrate that such fluff can be trivial in terms of .EXE size. And frankly, it's just the sort of lighthearted weekend project with which to cap off an all-too-serious 18-month development cycle.

A CREDIT SCREEN BACKGROUNDER The credit screen is the place in an application where the program's copyright notices

and acknowledgements are presented. In Windows speak, such screens are called "About Boxes." In DOS command line utilities the credits are usually simple: a single line of text, such as "Copyright 1988 by Danny Thorpe," is displayed when the program runs. On the other hand, flashy graphical applications simply beg for something more attuned to their graphical environment—a nice bit-map, at the least.

Early Windows programs were generally plain and simple, as were their credit screens. Microsoft's application design guidelines—*The Windows Interface: An*

*If properly written, these
controversial screens
don't adversely affect
code size or speed, and
can be just the right
finishing touch.*

Application Design Guide, Chapter 8, Section 8.6—called for an About Box dialog that was accessible from the Help menu and that displayed the name of the program, a version number, copyright notices, and required licensing acknowledgements. Followed to the letter, these early guidelines made for bare minimum credit screens.

Since those days, however, the *raison d'être* for the About Box has expanded so that it has become something of a billboard mini-advertisement for the program and its author or authoring company. Like a business card, today's About Box often displays the author's name, how to contact the author for support or

for registering shareware, and other essential information.

Particularly business-card-like is the belief that the About Box should (or can) make a quick, memorable impression, usually through colorful graphic images and distinctive text fonts. The About Box statement is one of the few devices in your product package that can provide users with a lasting mental image or impression of you and your company. From a marketing perspective, or as a way to generate product name recognition, the About Box statement ranks in importance with the artwork on the covers of your documentation and retail boxes. The retail box cover may entice the user to purchase the product, but the box is thrown away almost immediately. Documentation sits on the shelf, falls apart, or just gets lost. Only the About Box, which is built in to the program, will last as long as the program and accompany it wherever it goes.

The About Box, with rather simple text and perhaps a few adornments, is still the norm among smaller development teams and independent programmers. However, a simple dialog box doesn't work very well for large development teams: It's a little difficult to plunk 30 names into any dialog and make it attractive. The solution that comes to mind immediately is to scroll a list of credits in a smaller dialog box.

Why are the more interesting credit screens often hidden? Nothing requires that credits be concealed from the public, but I suspect corporate policy often plays a role. Policymakers like to insist that it's unprofessional to list names of real people alongside the company logo; a corporate image should transcend individual personalities. Also, many companies would rather not publish the names of their key developers in a legitimate effort

ABOUT.RC

Complete Listing

```

DLGABOUT DIALOG 36, 16, 96, 113
STYLE DS_MODALFRAME | WS_POPUP | WS_CAPTION | WS_SYSMENU
CLASS "borDlg"
CAPTION "About"
BEGIN
    CONTROL "", 100, "BorShade", 32769 | WS_CHILD | WS_VISIBLE, 8, 6, 80, 70
    CONTROL "OK", 1, "BorBtn", 1 | WS_CHILD | WS_VISIBLE | WS_TABSTOP, 31, 88, 34, 18
    CONTROL "", 101, "BorShade", 2 | WS_CHILD | WS_VISIBLE, -2, 80, 100, 2
    CONTROL "&I", 103, "BorBtn", 0 | WS_CHILD | WS_VISIBLE, -56, -58, 4, 6
END

```

Figure 1: ABOUT.RC, the resource template for the About Box dialog.

to protect their valuable workforce from predatory recruiters.

Be that as it may, everyone enjoys acknowledgement of a job well done. We all want to have a place to point to and say "That's me! I did that, there's the proof." So when policy pushes the credits out, the mischievous imps at the core of all great software invariably find other avenues of expression—credit screens that are hidden, and sometimes very hard to find. The rest of this article is directed to the mischievous imp in you.

REQUIREMENTS FOR OUR ABOUT BOX The About Box that we will create here contains a hidden credit screen. The small amount of code that is required to display a traditional About Box is usually isolated from the rest of a program's code, so inserting a few customizations there won't affect the rest of the program. The About Box will normally display a bitmap containing the required copyright and version information. When the user presses a secret hotkey, however, the Box will display its hidden credits by scrolling text and/or a list of names up through the bitmap area. As the end of the list scrolls away, the normal bitmap will scroll back into place.

To keep things simple, we'll use a single hotkey to activate the hidden credits. Implementing a system to handle elaborate Control-Alt-keystroke sequences to activate the hidden credits is not an easy task in an isolated Windows dialog.

In terms of code, we want a self-sufficient, reusable ObjectWindows object that will take care of the details. Ideally, all that the main program should have to provide to the About Box is the data unique to each application: the bitmap to be displayed in the About Box and the text of the credit list. It goes without say-

ing that the code should be as small as possible, to minimize the cost of including this indulgence in the program.

Let's start by looking at the dialog resource template (ABOUT.RC) for our About Box as shown in Figure 1. This dialog uses the Borland Windows Custom Control library (BWCC.DLL). The dialog class BorDlg gives us a chiseled-steel dialog background. A BorShade control, the BWCC gray group box, covers a large portion of the dialog and will frame our About Box bitmap. The BorShade with ID 101 is a horizontal speed-bump custom control, which displays a raised line dividing the bitmap display area from the OK button.

According to the resource script, this dialog contains two BWCC bitmapped buttons (BorButton), but when you look at the dialog box itself, shown in Figure 2, you will see only one OK button. Where and what is that &I button?

That's the first trick. The &I button has been placed at negative coordinates, which means that it will never be visible in the About Box dialog. It won't be immediately visible in a visual resource editor such as Resource Workshop, either, should someone open up your finished .EXE file to look at your resources. The hidden button could be located by other means, but most people won't go to those lengths and will pass right over the odd button in this dialog template.

Even though the &I button isn't visible, its shortcut key (I) remains active. Instead of having our application dabble in keystroke handling to activate the hidden credit list, we can

simply slip a button into the dialog and listen for a click message from the button. This provides a very simple, yet discreet, activation system. When the user presses the I key while the About Box is displayed, the hidden credit list is set in motion. The activation mechanism is completely local to the About Box and doesn't require any assistance from the main program, which is another bonus.

Notice that the About Box resource script doesn't contain a bitmap and that the OK button isn't quite centered in the dialog. The About Box object (described next) will accept a bitmap resource name from the main program when the object is initialized. The dialog object will resize and center itself and its controls to suit the dimensions of the provided bitmap. This makes the About Box almost totally self-sufficient, requiring zero maintenance in future applications that use it—a double bonus!

ABOUT.PAS The complete source code for the ABOUT.PAS unit is listed in Figure 3. The TAboutBox object runs the About Box dialog itself. The TCreditWindow object will be created on the fly by the TAboutBox.Init constructor, and it will be responsible for the actual display of the bitmap and the scrolling credit text.

The two data fields of the TAboutBox object are a title string pointer and the CreditWindow instance pointer. The Init constructor receives pointers to its parent window (usually the application's main window); a title string; a bitmap resource name or identifier; and an array of strings that is passed as a constant open array

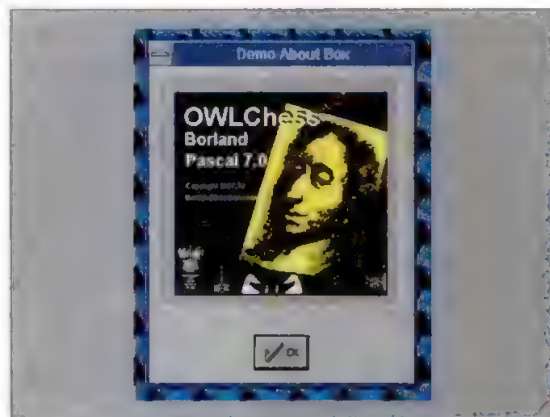


Figure 2: The About Box's normal appearance, with a bitmap supplied by the client application. Note that the About Box will resize itself to fit around the supplied bitmap.

You Name It.

TAKE YOUR CHOICE OF DESKTOP, LAPTOP OR NOTEBOOK



25mm Trackball
with duplicate controls
on rear of keyboard

KEYBOARDS WITH INTEGRATED POINTING
DEVICES IN
AWARD-WINNING
DESIGNS.



25mm Trackball
above the LED



February 25, 1992
Lexmark Enhanced
101 Key Keyboard



PORTABLE KEYBOARDS IN MULTIPLE LAYOUTS CUSTOMIZED FOR YOU.

AVAILABLE IN 35 LANGUAGES AND VIRTUALLY

LANGUAGES

You name it.

Demandez, vous l'aurez

Sagen Sie uns,
was Sie brauchen

Basta chiedere, e l'avrete

Usted dira

Слово за Вами!

Plus 29 others.



Custom
Colors

ANY COLOR OR
GRAPHICS.

MADE IN THE U.S.A.



Portable
Keyboards

We'll Make It.

Whatever kind of keyboards you need, Lexmark has your solution. Keyboards that are 101-key, 102-key, 84-key, 122-key or 84-key with detachable numpad. You name it. We'll make it. Deliver it on time. And back it up with unmatched technical support.

For more information and OEM pricing, call 1-800-777-4886; in Europe, call (33) 38 83 4308. Retail customers call 1-800-438-2468. To give your system a competitive edge, call us now!

Lexmark International, Inc., a former division of IBM®, is an independent worldwide company that develops, manufactures and markets IBM personal printers, IBM typewriters, related supplies and keyboards.

LEXMARK™

Make Your Mark

IBM is a registered trademark of International Business Machines Corporation in the United States and/or other countries, and used under license. PC Magazine Editors' Choice logo, ©1985 Ziff Communications Company. PC Magazine and PC Magazines Editors' Choice are registered trademarks of Ziff Communications Company. Lexmark is a trademark of Lexmark International, Inc. © Lexmark International, 1992.

CIRCLE 081 ON READER SERVICE CARD

ABOUT.PAS

1 of 2

```

{*****}
{      }
{ About box unit      }
{ Copyright (c) 1993 by Danny Thorpe }
{      }
{ for Borland Pascal 7.0 }
{*****}

unit About;

interface

uses Winprocs, Wintypes, Objects, OWindows, ODialogs;

($R About.res)

const
  idShade = 100;
  idBump = 101;
  idHotKey = 103;

type
  PCharArray = ^TPCharArray;
  TPCharArray = array [0..65520 div sizeof(PChar)] of PChar;

  PCreditWindow = ^TCreditWindow;
  TCreditWindow = object(TWindow)
    Bitmap: HBitmap;
    BitSize: TBitmap;
    ScrollUnit: Integer;
    ScrollRate: Integer;
    ScrollPos: Integer;
    FontHeight: Integer;
    StringList: PCharArray;
    StringCount: Word;
    constructor Init(AParent: PWindowsObject;
                     ABitmapName: PChar;
                     const AStringList: Array of PChar);
    destructor Done; virtual;
    function GetClassName: PChar; virtual;
    procedure GetWindowClass(var WC: TWndClass); virtual;
    procedure SetupWindow; virtual; { First place HWindow is valid }
    procedure WMDestroy(var Msg: TMessage); { Last place HWindow is valid }
    virtual wm_First + wm_Destroy;
    procedure Paint(DC: HDC; var PS: TPaintStruct); virtual;
    procedure ShowCredits; virtual;
    procedure WMTimer(var Msg: TMessage);
    virtual wm_First + wm_Timer;
  end;

  PAboutBox = ^TAboutBox;
  TAboutBox = object(TDialog)
    Title: PChar;
    CreditWindow: PCreditWindow;
    constructor Init(AParent: PWindowsObject;
                     ATitle, ABitmapName: PChar;
                     const AStringList: Array of PChar);
    destructor Done; virtual;
    procedure SetupWindow; virtual;
    function GetResName: PChar; virtual;
    procedure InitCreditWindow(ABitmapName: PChar;
                               const AStringList: array of PChar); virtual;
    procedure ShowCredits(var Msg: TMessage);
    virtual id_First + idHotKey;
  end;

implementation

uses Strings;

constructor TCreditWindow.Init(AParent: PWindowsObject;
                               ABitmapName: PChar;
                               const AStringList: Array of PChar);
var
  DC: HDC;
  OldFont: HFont;
  TM: TTextMetric;
begin
  inherited Init(AParent, nil);
  Attr.Style := ws_Child or ws_Visible;
  Bitmap := LoadBitmap(HInstance, ABitmapName);
  if Bitmap = 0 then
  begin
    Status := em_InvalidWindow;
    Exit;
  end;
  GetObject(Bitmap, SizeOf(BitSize), @BitSize);
  ScrollPos := 0;
  DC := GetDC(0);
  ScrollUnit := 2;
  ScrollRate := 00;
  OldFont := SelectObject(DC, GetStockObject(ANSI_VAR_FONT));
  GetTextMetrics(DC, TM);
  FontHeight := TM.tmHeight + TM.tmExternalLeading + 5;
  SelectObject(DC, OldFont);
  ReleaseDC(0, DC);
  StringList := @AStringList;
  StringCount := High(AStringList)+1;
end;

destructor TCreditWindow.Done;
begin
  inherited Done;
  DeleteObject(Bitmap);
end;

function TCreditWindow.GetClassName: PChar;
begin
  GetClassName := 'OWLAboutBitmap';
end;

procedure TCreditWindow.GetWindowClass(var WC: TWndClass);
begin
  inherited GetWindowClass(WC);
  WC.Style := cs_ByteAlignWindow; { for BitBlt speed }
  WC.hbrBackground := GetStockObject(Black_Brush);
end;

procedure TCreditWindow.SetupWindow;
begin
  inherited SetupWindow;
  SetWindowPos(HWindow, 0, 0, 0, BitSize.bmWidth, BitSize.bmHeight,
               swp_NoMove or swp_NoZOrder or swp_NoActivate or swp_NoRedraw);
end;

procedure TCreditWindow.WMDestroy(var Msg: TMessage);
begin
  if ScrollPos <> 0 then { We're scrolling and need to kill the timer }
  begin
    KillTimer(HWindow, 1);
    ScrollPos := 0;
  end;
  inherited WMDestroy(Msg);
end;

procedure TCreditWindow.Paint(DC: HDC; var PS: TPaintStruct);
var
  R: TRect;
  FirstLine, LastLine, Y: Integer;
begin
  procedure DrawBitmap(Y: Integer);
  var
    MemDC: HDC;
    OldBits: HBitmap;
  begin
    MemDC := CreateCompatibleDC(DC);
    OldBits := SelectObject(MemDC, Bitmap);
    BitBlt(DC, 0, Y, Attr.W, Attr.H, MemDC, 0, 0, srcCopy);
    SelectObject(MemDC, OldBits);
    DeleteDC(MemDC);
  end;

  SaveDC(DC);
  SetViewportOrg(DC, 0, -ScrollPos);
  OffsetRect(PS.rcPaint, 0, ScrollPos);
  with R do
  begin
    Left := 0;
    Top := 0;
    Right := Attr.W;
    Bottom := Attr.H;
  end;
  if Bool(IntersectRect(R, PS.rcPaint, R)) then
  begin
    DrawBitmap(0);
    with PS.rcPaint do
    begin
      if (R.Top < Top) and (R.Bottom > Top) then Top := R.Bottom;
      if (R.Top < Bottom) and (R.Bottom > Bottom) then Bottom := R.Top;
      if Top > Bottom then Top := Bottom;
    end;
  end;
  if ScrollPos > 0 then { we're scrolling }
  begin
    FirstLine := (PS.rcPaint.Top - Attr.H) div FontHeight;
    if FirstLine < 0 then FirstLine := 0;
    if FirstLine < StringCount then
    begin
      { we have text to draw }
      SetTextAlign(DC, TA_Center);
      SetBkColor(DC, 0);
      SetTextColor(DC, RGB($ff,$ff,$ff));
      LastLine := (PS.rcPaint.Bottom - Attr.H) div FontHeight;
      for Y := FirstLine to LastLine do

```



Figure 3: ABOUT.PAS, the Pascal OWL source code for an About Box and hidden credits window.

INTRODUCING NEW COOLSCAN.TM

TO BE A GIANT AMONG SCANNERS, YOU DON'T HAVE TO BE BIG. OR EXPENSIVE.

Don't let Coolscan's small size (or price tag) fool you. This new slide scanner from Nikon delivers detail so sharp and color so vivid, others seem pale by comparison.

Coolscan is a cinch to operate, too. Simply insert a 35mm slide or negative into the scanner slot. Select a desired resolution up to 2700 dpi. And the scanner does the rest. Coolscan's optical definition, color sensitivity and reliability make it the new standard of quality and value in desktop film scanners.

Thanks to our patented, solid-state illumination technology, Coolscan is also excep-

tionally quiet and compact. In fact, it mounts right into any available half-height disk drive bay in your desktop computer. At \$2195* Coolscan fits nicely into any budget, too. A lightweight, portable, external model, compatible with PCs, Macs or any computer with a SCSI interface, is also available for just \$2495*.

So if you didn't think you could afford the quality of a Nikon, think again. And take your scans to a higher level for less. With new Coolscan. For the location of your nearest Nikon Coolscan dealer, or for a brochure, call 1-800-42-NIKON or (516) 547-4355.



Shown actual size.

ABOUT.PAS

2 of 2

```

if Y < StringCount then
  TextOut(DC, Attr.W div 2, Y*FontHeight + Attr.H,
    StringList^Y, StrLen(StringList^Y));
end;
      { Paint second image of bitmap at bottom }
if PS.rcPaint.Bottom > (Attr.H+FontHeight*StringCount) then
  DrawBitmap(Attr.H + FontHeight * StringCount);
end;
RestoreDC(DC, -1);
end;

procedure TCreditWindow.ShowCredits;
begin
  SetTimer(HWindow, 1, ScrollRate, nil);
end;

procedure TCreditWindow.WMTimer(var Msg: TMessage);
begin
  Inc(ScrollPos, ScrollUnit);
  { Check to see if it's time to stop scrolling }
  if ScrollPos > Attr.H + FontHeight * StringCount then
  begin
    ScrollPos := 0;
    KillTimer(HWindow, 1);
    InvalidateRect(HWindow, nil, False);
  end
  else
    ScrollWindow(HWindow, 0, -ScrollUnit, nil, nil);
  UpdateWindow(HWindow);
end;

{.....}

constructor TAboutBox.Init(AParent: PWindowsObject;
  ATitle, ABitmapName: PChar;
  const AStringList: array of PChar);
begin
  inherited Init(AParent, GetResName);
  Title := StrNew(ATitle);
  InitCreditWindow(ABitmapName, AStringList);
end;

destructor TAboutBox.Done;
begin
  inherited Done;
  if Title <> nil then
    StrDispose(Title);
end;

procedure TAboutBox.SetupWindow;
var
  RDialog, R, RBitWnd, RShade, RBump, ROK: TRect;
  X8, Y8: Integer;
  DC: HDC;
begin
  inherited SetupWindow;
  SetWindowText(HWindow, Title);
  DC := GetDC(HWindow);
  X8 := GetDeviceCaps(DC, LogPixelsX) div 8;  { 1/8 inch }
  Y8 := GetDeviceCaps(DC, LogPixelsY) div 8;
  ReleaseDC(HWindow, DC);
  GetClientRect(GetDlgItem(HWindow, idShade), RShade);
  GetClientRect(GetDlgItem(HWindow, idBump), RBump);
  GetClientRect(GetDlgItem(HWindow, idOK), ROK);
  GetClientRect(CreditWindow^.HWindow, RBitWnd);
  RShade.Top := Y8;
  RShade.Left := X8;

```

```

if RShade.Right < RBitWnd.Right + 2*X8 then
  RShade.Right := RBitWnd.Right + 2*X8;
if RShade.Bottom < RBitWnd.Bottom + 2*Y8 then
  RShade.Bottom := RBitWnd.Bottom + 2*Y8;

with RDialog do
begin
  GetWindowRect(HWindow, RDialog);
  GetClientRect(HWindow, R);
  Right := Right - Left - R.Right;
  Bottom := Bottom - Top - R.Bottom;
  Right := Right + X8 + RShade.Right + X8;  { 1/8 inch margins }
  Bottom := Bottom + Y8 + RShade.Bottom
    + Y8 + RBump.Bottom
    + Y8 + ROK.Bottom + Y8;
  if Parent <> nil then
  begin
    GetWindowRect(Parent^.HWindow, R);
    { Center dialog in parent's window }
    Left := R.Left + (R.Right - R.Left) div 2 - Right div 2;
    Top := R.Top + (R.Bottom - R.Top) div 2 - Bottom div 2;
  end;
  SetWindowPos(HWindow, 0, Left, Top, Right, Bottom,
    swp_NoActivate or swp_NoZOrder);
end;
with RShade do
begin
  SetWindowPos(GetDlgItem(HWindow, idShade), 0, Left, Top,
    Right, Bottom, swp_NoActivate or swp_NoZOrder);
  SetWindowPos(CreditWindow^.HWindow, 0, Left + X8, Top + Y8, 0, 0,
    swp_NoActivate or swp_NoSize or swp_NoZOrder);
end;
with RBump do
begin
  Left := -1;
  Right := RDialog.Right + 2;
  Top := RShade.Top + RShade.Bottom + Y8;
  SetWindowPos(GetDlgItem(HWindow, idBump), 0, Left, Top, Right, Bottom,
    swp_NoActivate or swp_NoZOrder);
end;
GetClientRect(HWindow, R);
with ROK do
  SetWindowPos(GetDlgItem(HWindow, idOK), 0,
    R.Right div 2 - Right div 2,
    RBump.Top + RBump.Bottom + Y8, 0, 0,
    swp_NoActivate or swp_NoZOrder or swp_NoSize);
end;

function TAboutBox.GetResName: PChar;
begin
  GetResName := 'dlgAbout';
end;

procedure TAboutBox.InitCreditWindow(ABitmapName: PChar;
  const AStringList: array of PChar);
begin
  CreditWindow := New(PCreditWindow, Init(@Self, ABitmapName, AStringList));
end;

procedure TAboutBox.ShowCredits(var Msg: TMessage);
begin
  CreditWindow^.ShowCredits;
end;

end.

```

parameter. Constant parameters and open array parameters are new language features of BP7; for conversion to earlier Pascals, see the notes at the end of the article.

The title string is a constructor parameter that allows the application to provide the dialog with a customized title (for example, "About Borland Pascal"), instead of having to use whatever title is in the About Box's own dialog template. Remember, we want to reuse this About Box in many applications, so any application-specific information should be given

to us by the application.

TAboutBox.Init passes the bitmap resource name and string list array in a call to InitCreditWindow, which is a virtual method of TAboutBox. InitCreditWindow initializes CreditWindow as an instance of the TCreditWindow type, passing its parameters on to TCreditWindow.Init. Putting this type-specific initialization in a virtual method allows future descendants of TAboutBox to override this method and use a different kind of TCreditWindow—presumably a descendant of TCreditWindow. No other

changes to the TAboutBox descendant will be necessary to install a different kind of CreditWindow. I think of this as *nondeterministic component initialization*, since the type of the component objects used by the main object is not entirely fixed or predetermined and so can be overridden in descendants. (This point is further discussed in the sidebar, "Creating Reusable Code.")

Figure 4 is the C++ version of this OWL object, which implements the same About Box behavior as our Pascal example. Because C++ has an aversion to vir-

**SEE US AT
WINDOWS WORLD
BOOTH W7214**

MGA and DynaView making AutoCAD designs come to life.

Introducing Matrox

MGA...

**Harness the Power of
64-Bit Graphics**

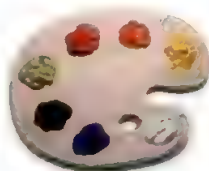
Introducing Matrox MGA, the new series of 64-bit graphics accelerators for the PC Power User.

MGA's 64-bit graphics engine surpasses regular 32-bit technology to deliver workstation graphics performance for CAD and Windows professionals. MGA gives you up to 12 times more hardware performance and up to 60 million WinMarks.

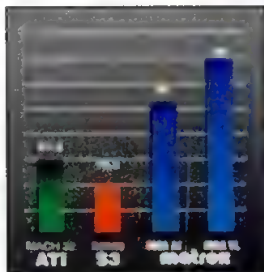
In real-life applications, MGA delivers speed with the highest display resolutions, true color, real-time 3D and the best productivity enhancing features.

For Windows users, MGA's Control Panel, lets you easily access features like hardware pan and zoom, virtual desktop, and on-the-fly resolu-

tion switching without having to leave your application or restart Windows. MGA displays 1024 x 768 in full 24-bit color and up to 1600 x 1200 in near true color with QCDP, Matrox's exclusive color quality dithering process.



Just a few of the 16.7 million colors to choose from.



Attention CAD users. MGA comes bundled with DynaView, the most powerful interface to AutoCAD and Microstation. In a viewport, you can interactively render 3D models with high-quality Gouraud shading. DynaView gives you the smoothest real-time pan and zoom in the industry.

MGA is the one-card graphics solution for Windows, CAD and Multimedia. MGA's Upgrade Options let you capture broadcast quality video, output graphics to standard video devices or increase your printing speed up to 600%.

For the PC Power User on a budget, MGA starts as low as \$599. Call us for more information 1-800-361-1408.

Experience the performance of MGA, graphics designed for the Power User.

**MATROX
MGA
POWER GRAPHICS**



matrox

CIRCLE 124 ON READER SERVICE CARD

"Ami Pro 3.0...ups the ante in the fight among the Big Three: Ami Pro, Microsoft Word 2.0 and WordPerfect for Windows. It's full of clever features that make your work easier and faster."

BYTE 9/92

"In the Windows word processing world, Ami Pro 3.0 comes close to being perfect ...It stands above Word and WordPerfect both in its function and in its speed."

Home Office Computing 1/93

Advanced Word Processors for Windows	
	Overall Evaluation
1ST Ami Pro 3.0 for Windows	8.7
2ND Word for Windows 2.0	8.1
3RD WordPerfect 5.1 for Windows	6.1

"Ami Pro 3.0 takes the lead as the Windows word processor"

If you're still under the impression that Microsoft® Word and WordPerfect® are the top dogs in the word processing arena, we've got news for you.

According to the top reviewers, and people who've tried it, Lotus® Ami Pro® 3.0 is far and away the Windows™ word processor of choice. In fact, it's becoming increasingly clear with each new release, that Lotus

is the developer of choice for Windows applications.

Ami Pro wins the war of the words.

Simply put, Ami Pro is a faster, easier,

friendlier word processor to use. It does so many things with so little effort, most people never even bother to open the manual.

To name a few, there's real, no ifs-and-ors-buts WYSIWYG. There's Fast Format, for quick repetition of text formats. And, there are customizable, editable SmartIcons™ that give you instant, one-click access to most tasks.

There's also automatic renumbering of lists. Preview of Style Sheets. QuickStart on-line tutorial. Free 24 hour a day technical support.* And to ease your mind, a 60-day money back guarantee.



Ami Pro has won every major award in its category.

Software Digest, Ratings Report, Vol. 9, #6, Sept. 1992. Among all word processors tested. Reprints available upon request. *On weekdays, plus 7AM to 4PM on Saturdays. **Offer expires 9/30/93. Call for a list of eligible word processors. Cambridge, MA 02142. All rights reserved. Lotus and Ami Pro are registered trademarks and SmartIcons is a trademark of Lotus Development Corporation. Windows is a trademark of Microsoft Corporation. WordPerfect is a registered trademark of Corel Corporation.

"Ami Pro is the best word processor on the market...[it] goes the competition one better in every respect."

PC/Computing 12/92

"Ami Pro Version 3.0...is the most graphical, colorful and in many ways the most powerful word processor on the market...no other package can match its ambition, its range of functions or the sheer pleasure of using it."

PC Magazine 1/93

"Ami Pro 3.0 provides a host of new and enhanced features...that save time and make your work easier."

Windows Magazine 2/93

"You can learn to use Ami Pro...in about a day. Put the manual in a drawer as a first step. There are no required control codes, no deeply nested menus, no command words. This friendliness greatly expands and sharply changes the market."

Forbes 2/93

ad over Microsoft Word rd processor to beat."

InfoWorld 9/28/92

Have we convinced you to switch yet?

If you're switching from WordPerfect for DOS, relax. Ami Pro makes it easy. With features like seamless conversion of WordPerfect files. A SwitchKit so that when you type in WordPerfect commands, Ami Pro shows you how to perform the same functions using pull-down menus or one-click SmartIcons. And batch conversion, which you won't find in Word.

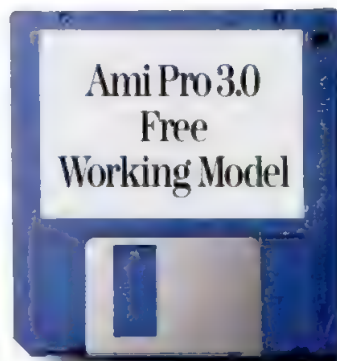
See for yourself. For free.

What drives hardened reviewers to use words like "love" and "pleasure" when describing Ami Pro?

Call us for a free working model and see for yourself.

If you're like more than a million other people, once you actually sit down with Ami Pro, you'll definitely choose it. Over Word. Over WordPerfect. Over every other word processor out there.

Call Lotus today, at **1-800-872-3387, ext. 8765**, for your free working model or to upgrade from your current word processor for just \$129**.



Ami Pro 3.0

Word Processor for Windows

Education priced Lotus products not included. Offer valid in U.S. only. Not to be combined with any other offer. Have your credit card and current word processor ready when you call. ©1993 Lotus Development Corporation, 55 Cambridge Parkway, Framingham, MA 01903. Software Digest is a registered trademark of NSTL, Inc. a McGraw-Hill Company. Adobe Type Manager and the ATM logo are registered trademarks of Adobe Systems, Inc. In Canada call 1-800-GO-LOTUS.

CIRCLE 143 ON READER SERVICE CARD

■ Creating Reusable Code

by Danny Thorpe

Component type-determinism is an important issue that you must consider when you're designing a set of reusable objects. Reusable, inheritable objects don't just happen; they must be *designed* to be good ancestors, so to speak. Among other things, beyond imposing a general-purpose base component type, good ancestors avoid forcing type specifics on their descendants. You can set up mechanisms to defer type-specific decisions (such as creating component instances) so as to provide the descendants with the greatest range of flexibility.

At some point in the hierarchy, of course, the type decisions must be made. The objects could be called terminal nodes of the object inheritance tree, since they do not work well as ancestors and rarely have descendants. You might also call these terminal nodes mules, for they usually do a lot of work and tend to be sterile. All OOP applications contain mule objects that perform specific tasks or operations, together with fertile, inheritable objects that handle general tasks and provide overall structure, code reuse, and modularity.

Calling a virtual method to perform type-specific work is one kind of type deferment mechanism. The base object can provide a useful default and still leave descendants an easy way to change that default in order to meet their specific needs. In the present program, without providing some kind of way for descendants to specify their own component types, we would be faced with either locking the TAboutBox object into using only a TCreditWindow instance, or with requiring the caller to provide a CreditWindow instance as a parameter to the Init constructor. The latter is very undesirable, as it opens up the internal details of the About Box to the client app and places greater requirements upon it. The name of the game in object-oriented programming is reducing components'

exposure of internal details to one another, and reducing the requirements on the client.

C++ doesn't like the idea of calling a virtual method within a constructor. When you call a virtual method you're potentially calling down into a descendant's code. Technically, if you're calling the virtual method from within an ancestor's constructor, the descendant has not yet been completely initialized. Thus you run the risk that the descendant's virtual method may use a data field of the object that hasn't been initialized. You run the same risk of this error in Pascal, but there are some additional pitfalls in C++'s automatic constructors that make the danger in C++ more real than that in Pascal. For this and other reasons, C++ compilers usually convert virtual method calls made in constructors into static calls. A static call from an ancestor's constructor will only call the ancestor's version of a method after the ancestor's data is initialized, as opposed to making a virtual call down into the descendants' versions of a method before the descendants' data is initialized. This makes the call safe; however, it completely defeats the purpose of the virtual method!

Another possible deferment mechanism for both C++ and Pascal is to avoid construction of the ClientWindow instance in the TAboutBox constructor at all. You can simply leave it nil until some later stage of the object's execution, a stage at which it is safe to call a virtual method. Such an opportunity is available in OWL. An OWL object's construction is split into two parts: things that happen before the Windows window handle has been created (the Init constructor) and things that happen after (the SetupWindow method). InitCreditWindow could thus be called from TAboutBox.SetupWindow, and this is in fact the solution that the C++ version of TAboutBox uses. The problem with this approach is that the object could

be successfully initialized by its constructor but later fail during construction of one of its components. The object, in other words, would temporarily exist in a partially complete state, and this situation is an open invitation for bugs.

In either solution, some part of the object's code is executed while the object is in a partially constructed state. Responsible coding by the author of the original object will minimize descendants' exposure to the partially constructed state. No less important is that documentation of what is and is not allowed during the incomplete phase will let the programmers of descendants of the object know what they can and should do.

The payoff is flexibility and reuse of the original object as well as portions of its original components in other areas of the same program, or in new projects down the line. In the excitement of a successful OOP project, you often hear of an object's being used in "a new context unforeseen by the original author." *Unforeseen* isn't quite accurate. The original author may not have envisioned your *particular* extensions while writing the object, but had that author not given some thought to how the object might need to be altered or enhanced, and spent the time driving out unnecessary assumptions and building in override opportunities, you wouldn't be able to apply your extensions in the first place.

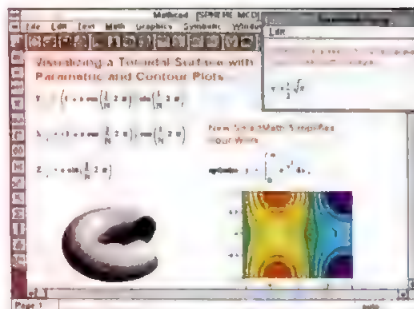
Writing reusable code doesn't mean you have to identify all future uses and extensions of the code. You need only identify the replaceable parts of the existing design and take moderate steps to ensure your base code doesn't contain assumptions that would prevent or block such modifications. Identify enhancement opportunities rather than specific enhancements themselves. Component type-deferment is one technique for providing override opportunities and making an object more reusable. □

New Mathcad 4.0 is ergonomically designed to relieve pressure on the most important part of your body.

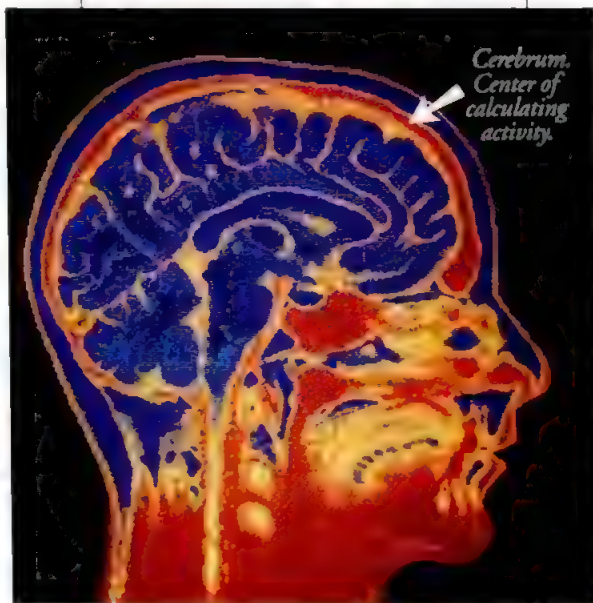
For everyone with better things to do with their brains than punch calculators, scribble on scratch pads, build spreadsheets and transcribe equations, we present Mathcad® 4.0. It's the best way ever to do engineering and scientific calculations, because it's smarter than ever about the way you work.

As always, Mathcad lets you enter equations anywhere on the worksheet. Graph results in 2-D and 3-D. Change variables and instantly update answers. And print presentation quality documents with text, graphics and equations in real math notation. But now there's even more.

Like new Windows features that make Mathcad easier to use. Including the tool bar with mouse-click execution of file, edit, math and text controls. And full Windows DDE and OLE support that integrates Mathcad with your Windows spreadsheet.



New Mathcad 4.0 has more features, more functions, and better usability than ever.



All new SmartMath knows when an equation is best solved numerically or symbolically, and hands off the work to the appropriate calculating engine. New live symbolic calculations automatically update just like numerical ones. And new symbolic optimization automatically

simplifies equations for faster, more concise results.

In addition to more than 200 built-in numeric and symbolic functions, you'll find enhancements like trailing zeros, extra unit and Nth derivative operators. As well as extended graphing capabilities with Polar and Contour plots.

Best of all, new Mathcad 4.0 runs twice as fast as before.

So why suffer through another day of calculators, scratch pads and spreadsheets? Get a load off your mind with Mathcad 4.0.

Call now for a free working model, to upgrade, or for

information on optional Mathcad Applications Packs and Electronic Handbooks.*

Call: 617-577-1017

Fax: 617-577-8829

1-800-MATHCAD



FREE Mathcad 4.0 Working Model.



The Mathcad Working Model includes a concise demonstration and a fully functioning version of the product. It's the best way to introduce yourself to the power and ease of Mathcad.

Name Title

Company

Address

City State Zip

Country Phone

SPECIFY:

- ☐ PC Windows* ☐ PC DOS
☐ UNIX* ☐ Macintosh*
☐ 3 1/2" ☐ 5 1/4" Diskette

PCM82

MathSoft, Inc. 201 Broadway, Cambridge, MA 02139 USA • Phone: 1-800-628-4223 • 617-577-1017 • Fax: 617-577-8829

MathSoft Europe, P.O. Box 58, Livingston, UK EH54 7AE • Phone: +44.506.460373 • Fax: +44.506.460374

© 1993 MathSoft, Inc. TM and ® signify manufacturer's trademark or registered trademark respectively. *Electronic Handbooks require Mathcad 3.1 or higher.

CIRCLE 154 ON READER SERVICE CARD

ABOUT.CPP and ABOUT.H

1 of 2

A

```
//
// About box object for C++ OWL
//
// Copyright 1993 by Danny Thorpe
//

#include "about.h"

TCreditWindow::TCreditWindow(PWindowsObject AParent,
                             LPCSTR ABitmapName, LPSTR AStringList[])
    : TWindow(AParent, NULL)
{
    HDC DC;
    HFONT OldFont;
    TEXTMETRIC TM;
    LPSTR P;

    Attr.Style = WS_CHILD | WS_VISIBLE;
    Bitmap = LoadBitmap(GetApplication()->hInstance, ABitmapName);
    if (!Bitmap)
    {
        Status = EM_INVALIDWINDOW;
        return;
    }
    GetObject(Bitmap, sizeof(BitSize), &BitSize);
    ScrollPos = 0;
    DC = GetDC(0);
    ScrollUnit = 2;
    ScrollRate = 80;
    OldFont = SelectObject(DC, GetStockObject(ANSI_VAR_FONT));
    GetTextMetrics(DC, &TM);
    FontHeight = TM.tmHeight + TM.tmExternalLeading + 5;
    SelectObject(DC, OldFont);
    ReleaseDC(0, DC);
    StringList = AStringList;

    // Count strings in stringlist.
    for (StringCount = 0; StringList[StringCount]; StringCount++);
}

TCreditWindow::~TCreditWindow()
{
    DeleteObject(Bitmap);
}

void TCreditWindow::GetWindowClass(WNDCLASS& WC)
{
    TWindow::GetWindowClass(WC);
    WC.style = CS_BYTEALIGNWINDOW; // for BitBlt speed
    WC.hbrBackground = GetStockObject(BLACK_BRUSH);
}

void TCreditWindow::SetupWindow()
{
    TWindow::SetupWindow();
    SetWindowPos(HWindow, 0, 0, 0, BitSize.bmWidth, BitSize.bmHeight,
                 SWP_NOMOVE | SWP_NOZORDER | SWP_NOACTIVATE | SWP_NOREDRAW);
}

void TCreditWindow::WMDestroy(RTMessage Msg)
{
    if (ScrollPos) // We're scrolling and need to kill the timer
    {
        KillTimer(HWindow, 1);
        ScrollPos = 0;
    }
    TWindow::WMDestroy(Msg);
}

void DrawBitmap(HDC DC, int X, int Y, int W, int H, HBITMAP Bitmap)
{
    HDC MemDC = CreateCompatibleDC(DC);
    HBITMAP OldBits = SelectObject(MemDC, Bitmap);
    BitBlt(DC, X, Y, W, H, MemDC, 0, 0, SRCCOPY);
    SelectObject(MemDC, OldBits);
    DeleteDC(MemDC);
}

void TCreditWindow::Paint(HDC DC, PAINTSTRUCT& PS)
{
    RECT R;
    int FirstLine, LastLine, Y;

    SaveDC(DC);
    SetViewportOrg(DC, 0, -ScrollPos);
    OffsetRect(&PS.rcPaint, 0, ScrollPos);
    R.left = 0;
    R.top = 0;
    R.right = Attr.W;
    R.bottom = Attr.H;

    if (IntersectRect(&R, &PS.rcPaint, &R))
    {
        DrawBitmap(DC, 0, 0, Attr.W, Attr.H, Bitmap);
        if ((R.top < PS.rcPaint.top) && (R.bottom > PS.rcPaint.top))
            PS.rcPaint.top = R.bottom;
        if ((R.top < PS.rcPaint.bottom) && (R.bottom > PS.rcPaint.bottom))
            PS.rcPaint.bottom = R.top;
        if (PS.rcPaint.top > PS.rcPaint.bottom)
            PS.rcPaint.top = PS.rcPaint.bottom;
    }
    if (ScrollPos > 0) // we're scrolling
    {
        FirstLine = (PS.rcPaint.top - Attr.H) / FontHeight;
        if (FirstLine < 0)
            FirstLine = 0;
        if (FirstLine < StringCount)
        {
            // we have text to draw
            SetTextAlign(DC, TA_CENTER);
            SetBkColor(DC, 0);
            SetTextColor(DC, RGB(0xff,0xff,0xff));
            LastLine = (PS.rcPaint.bottom - Attr.H) / FontHeight;
            for (Y = FirstLine; Y <= LastLine; Y++)
            {
                if (Y < StringCount)
                    TextOut(DC, Attr.W / 2, Y*FontHeight + Attr.H,
                           StringList[Y], _fstrlen(StringList[Y]));
            }
        }
        // Paint second image of bitmap at bottom
        if (PS.rcPaint.bottom > (Attr.H + FontHeight * StringCount))
            DrawBitmap(DC, 0, Attr.H + FontHeight * StringCount,
                      Attr.W, Attr.H, Bitmap);
    }
    RestoreDC(DC, -1);
}

void TCreditWindow::ShowCredits()
{
    SetTimer(HWindow, 1, ScrollRate, NULL);
}

void TCreditWindow::WMTimer(RTMessage)
{
    ScrollPos += ScrollUnit;
    // Check to see if it's time to stop scrolling
    if (ScrollPos > Attr.H + FontHeight * StringCount)
    {
        ScrollPos = 0;
        KillTimer(HWindow, 1);
        InvalidateRect(HWindow, NULL, FALSE);
    }
    else
        ScrollWindow(HWindow, 0, -ScrollUnit, NULL, NULL);
    UpdateWindow(HWindow);
}

//.....

TAboutBox::TAboutBox(PWindowsObject AParent,
                     LPCSTR ATitle,
                     LPCSTR ABitmapName,
                     LPSTR AStringList[],
                     LPSTR AResName) :
    TDialog(AParent, AResName)
{
    Title = _fstdup(ATitle ? ATitle : "");
    BitmapName = ABitmapName;
    StringList = AStringList;
}

TAboutBox::~TAboutBox()
{
    if (HIWORD(Title))
        free((void*)Title);
}

void TAboutBox::SetupWindow()
{
    RECT RDialog, RBitWnd, RShade, RBump, ROK;
    int X8, Y8;
    HDC DC;

    InitCreditWindow(BitmapName, StringList);
    TDialog::SetupWindow();
    SetWindowText(HWindow, Title);
    DC = GetDC(HWindow);
    X8 = GetDeviceCaps(DC, LOGPIXELSX) / 8; // 1/8 inch
    Y8 = GetDeviceCaps(DC, LOGPIXELSY) / 8;
    ReleaseDC(HWindow, DC);
    GetClientRect(GetDlgItem(HWindow, IDSHADE), &RShade);
    GetClientRect(GetDlgItem(HWindow, IDBUMP), &RBump);
    GetClientRect(GetDlgItem(HWindow, IDOK), &ROK);
}
```

```
if (IntersectRect(&R, &PS.rcPaint, &R))
{
    DrawBitmap(DC, 0, 0, Attr.W, Attr.H, Bitmap);
    if ((R.top < PS.rcPaint.top) && (R.bottom > PS.rcPaint.top))
        PS.rcPaint.top = R.bottom;
    if ((R.top < PS.rcPaint.bottom) && (R.bottom > PS.rcPaint.bottom))
        PS.rcPaint.bottom = R.top;
    if (PS.rcPaint.top > PS.rcPaint.bottom)
        PS.rcPaint.top = PS.rcPaint.bottom;
}
if (ScrollPos > 0) // we're scrolling
{
    FirstLine = (PS.rcPaint.top - Attr.H) / FontHeight;
    if (FirstLine < 0)
        FirstLine = 0;
    if (FirstLine < StringCount)
    {
        // we have text to draw
        SetTextAlign(DC, TA_CENTER);
        SetBkColor(DC, 0);
        SetTextColor(DC, RGB(0xff,0xff,0xff));
        LastLine = (PS.rcPaint.bottom - Attr.H) / FontHeight;
        for (Y = FirstLine; Y <= LastLine; Y++)
        {
            if (Y < StringCount)
                TextOut(DC, Attr.W / 2, Y*FontHeight + Attr.H,
                       StringList[Y], _fstrlen(StringList[Y]));
        }
    }
    // Paint second image of bitmap at bottom
    if (PS.rcPaint.bottom > (Attr.H + FontHeight * StringCount))
        DrawBitmap(DC, 0, Attr.H + FontHeight * StringCount,
                  Attr.W, Attr.H, Bitmap);
}
RestoreDC(DC, -1);

void TCreditWindow::ShowCredits()
{
    SetTimer(HWindow, 1, ScrollRate, NULL);
}

void TCreditWindow::WMTimer(RTMessage)
{
    ScrollPos += ScrollUnit;
    // Check to see if it's time to stop scrolling
    if (ScrollPos > Attr.H + FontHeight * StringCount)
    {
        ScrollPos = 0;
        KillTimer(HWindow, 1);
        InvalidateRect(HWindow, NULL, FALSE);
    }
    else
        ScrollWindow(HWindow, 0, -ScrollUnit, NULL, NULL);
    UpdateWindow(HWindow);
}

//.....

TAboutBox::TAboutBox(PWindowsObject AParent,
                     LPCSTR ATitle,
                     LPCSTR ABitmapName,
                     LPSTR AStringList[],
                     LPSTR AResName) :
    TDialog(AParent, AResName)
{
    Title = _fstdup(ATitle ? ATitle : "");
    BitmapName = ABitmapName;
    StringList = AStringList;
}

TAboutBox::~TAboutBox()
{
    if (HIWORD(Title))
        free((void*)Title);
}

void TAboutBox::SetupWindow()
{
    RECT RDialog, RBitWnd, RShade, RBump, ROK;
    int X8, Y8;
    HDC DC;

    InitCreditWindow(BitmapName, StringList);
    TDialog::SetupWindow();
    SetWindowText(HWindow, Title);
    DC = GetDC(HWindow);
    X8 = GetDeviceCaps(DC, LOGPIXELSX) / 8; // 1/8 inch
    Y8 = GetDeviceCaps(DC, LOGPIXELSY) / 8;
    ReleaseDC(HWindow, DC);
    GetClientRect(GetDlgItem(HWindow, IDSHADE), &RShade);
    GetClientRect(GetDlgItem(HWindow, IDBUMP), &RBump);
    GetClientRect(GetDlgItem(HWindow, IDOK), &ROK);
}
```



Figure 4: ABOUT.CPP (A) and ABOUT.H (B), the Borland C++ OWL source code for an About Box.



Exercise Your Video ... Stretch It!

Why settle for an out-of-shape graphics board? Let ATI's new GRAPHICS ULTRA+ and GRAPHICS ULTRA PRO cards pump up your computer with graphics and multimedia video acceleration.

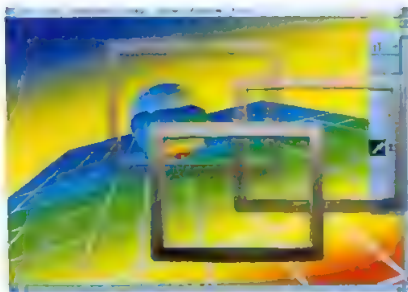


Only the GRAPHICS ULTRA+/PRO cards come ready to accelerate¹ multimedia applications under Windows. Stretch small video images to partial or full screen for better visibility ... and maintain smooth dynamic motion (when others fall behind).

ATI's *mach32* Accelerator Chip adds the muscle to run Windows, NT, OS/2 and CAD fast ... even faster

than other local bus solutions. With 2.0MB of video memory, ATI accelerates 1024x768 in 65,000 colors. Run resolutions up to 1280x1024, colors up to 24-bit, and sit-up to flicker-free graphics at 76Hz refresh rate. Plus, the best software support of ANY accelerator product with ATI, accelerated by ***mach32*** ATi TECHNOLOGIES INC.

Exercise your options under Windows with the FlexDesk Control Panel or use DeskScan to pan and zoom across a virtual desktop. And our exclusive CRYSTAL FONTS smooths TrueType for laser-quality text right on-screen.



GRAPHICS ULTRA +

- ▶ Accelerated 1024x768 at 65,000 colors
- ▶ True color (16.7M) at 800x600
- ▶ Multimedia Video Acceleration
- ▶ Fast zero wait-state VGA
- ▶ Includes three button input mouse²
- ▶ Available in 1.0MB or 2.0MB versions
- ▶ 5 year warranty
- ▶ Priced from \$399.00³



GRAPHICS ULTRA PRO adds

- ▶ Even faster performance with VRAMs
- ▶ Accelerated 1280x1024 at 256 colors up to 74Hz non-interlaced
- ▶ Available in ISA, EISA and Micro Channel versions
- ▶ Priced from \$599.00³



Avoid low impact graphics. Shape up with ATI Graphics and Multimedia Video Accelerators.

SEE US AT WINDOWS WORLD, BOOTH #W7038

ACCELERATORS • GRAPHICS • MULTIMEDIA • COMMUNICATIONS



Perfecting the PC

ATI TECHNOLOGIES INC.
3761 Victoria Park Avenue
Scarborough, Ontario
Canada M1W 3S2
Tel: (416) 756-0718
Fax: (416) 756-0720

Copyright © ATI Technologies Inc., 1993. All company and/or product names are trademarks and/or registered trademarks of their respective manufacturers. Accelerates Indeo Video, RLE and Video 1 compressed files under Video for Windows. QuickTime for Windows support is planned. Performance varies depending on system configuration. ¹ISA versions only. ²Suggested retail prices, dealers may sell for less. Prices and features are subject to change without notice. CIRCLE 228 ON READER SERVICE CARD

ABOUT.CPP and ABOUT.H

2 of 2

```

GetClientRect(CreditWindow->HWindow, &RBitWnd);
RShade.top = Y8;
RShade.left = X8;
if (RShade.right < RBitWnd.right + 2*X8)
    RShade.right = RBitWnd.right + 2*X8;
if (RShade.bottom < RBitWnd.bottom + 2*Y8)
    RShade.bottom = RBitWnd.bottom + 2*Y8;

GetWindowRect(HWindow, &RDialog);
GetClientRect(HWindow, &R);
RDialog.right = RDialog.right - RDialog.left - R.right;
RDialog.bottom = RDialog.bottom - RDialog.top - R.bottom;
RDialog.right += X8 + RShade.right + X8; // 1/8 inch margins
RDialog.bottom += Y8 + RShade.bottom
                + Y8 + RBump.bottom
                + Y8 + ROk.bottom + Y8;

if (Parent)
{
    GetWindowRect(Parent->HWindow, &R);
    // Center dialog in parent's window
    RDialog.left = R.left + (R.right - R.left) / 2
                  - RDialog.right / 2;
    RDialog.top = R.top + (R.bottom - R.top) / 2
                 - RDialog.bottom / 2;
};
SetWindowPos(HWindow, 0, RDialog.left, RDialog.top,
             RDialog.right, RDialog.bottom,
             SWP_NOACTIVATE | SWP_NOZORDER);

SetWindowPos(GetDlgItem(HWindow, IDSHADE), 0, RShade.left,
             RShade.top, RShade.right, RShade.bottom,
             SWP_NOACTIVATE | SWP_NOZORDER);
SetWindowPos(CreditWindow->HWindow, 0, RShade.left + X8,
             RShade.top + Y8, 0, 0,
             SWP_NOACTIVATE | SWP_NOSIZE | SWP_NOZORDER);

RBump.left = -1;
RBump.right = RDialog.right + 2;
RBump.top = RShade.top + RShade.bottom + Y8;
SetWindowPos(GetDlgItem(HWindow, IDBUMP), 0, RBump.left,
             RBump.top, RBump.right, RBump.bottom,
             SWP_NOACTIVATE | SWP_NOZORDER);

GetClientRect(HWindow, &R);
SetWindowPos(GetDlgItem(HWindow, IDOK), 0,
             R.right / 2 - ROk.right / 2,
             RBump.top + RBump.bottom + Y8, 0, 0,
             SWP_NOACTIVATE | SWP_NOSIZE | SWP_NOZORDER);
};

void TAboutBox::InitCreditWindow(LPCSTR ABitmapName, LPSTR AStringList
{
}
{
    CreditWindow = new TCreditWindow(this, ABitmapName, AStringList);
};

void TAboutBox::ShowCredits(RTMessage)
{
    CreditWindow->ShowCredits();
};

```

```

B
//
// About box object for C++ OWL
//
// Copyright 1993 by Danny Thorpe
//

#include <owl.h>
#include <owldefs.h>
#include <string.h>
#include <alloc.h>

#define IDSHADE 100
#define IDBUMP 101
#define IDHOTKEY 102

class TCreditWindow : public TWindow {
public:
    HBITMAP Bitmap;
    BITMAP BitSize;
    int ScrollUnit;
    int ScrollRate;
    int ScrollPos;
    int FontHeight;
    LPSTR* StringList;
    int StringCount;

    TCreditWindow(PTWindowsObject AParent,
                  LPCSTR ABitmapName,
                  LPSTR AStringList[]);
    virtual ~TCreditWindow();
    virtual LPSTR GetClassName() {return "OWLAboutBitmap";};
    virtual void GetWindowClass(WNDCLASS& WC);
    virtual void SetupWindow(); //
    First place HWindow is valid
    virtual void WMDestroy(RTMessage Msg) //Last place HWindow is valid
        = [WM_FIRST + WM_DESTROY];
    virtual void Paint(HDC DC, PAINTSTRUCT& PS);
    virtual void ShowCredits();
    virtual void WMTimer(RTMessage Msg)
        = [WM_FIRST + WM_TIMER];
};

_CLASSDEF(TAboutBox) // this is potentially exportable

class TAboutBox : public TDialog {
public:
    LPCSTR Title, BitmapName;
    LPSTR* StringList;
    TCreditWindow* CreditWindow;
    TAboutBox(PTWindowsObject AParent,
              LPCSTR ATitle,
              LPCSTR ABitmapName,
              LPSTR AStringList[],
              LPSTR AResName = "dlgAbout");
    virtual ~TAboutBox();
    virtual void SetupWindow();
    virtual void InitCreditWindow(LPCSTR ABitmapName, LPSTR AStringList
{
}
{
    virtual void ShowCredits(RTMessage Msg) = [ID_FIRST + IDHOTKEY];
};

```

tual method calls from within constructors, nondeterministic component initialization is achieved in this case through a virtual method call from the SetupWindow method, after the constructor has initialized the object.

The Pascal TAboutBox also has a GetResName function, which returns the string name of the dialog template from which TAboutBox creates itself. This, too, is a virtual function that is called from the Init constructor. TAboutBox descendants can override the GetResName virtual function to force TAboutBox to use a different resource template. The resource template name must be de-

termined when the object is constructed—it cannot wait until later in the object's execution lifetime, for instance at the point at which SetupWindow is called. In the C++ TAboutBox, the resource name is provided as an optional parameter to the constructor with a default value. Descendants or clients can therefore pass in different resource names if they so choose.

TAboutBox.SetupWindow does all the resizing of the dialog and controls so that they suit the size of the ClientWindow's bitmap. By the time execution returns from the call to the inherited SetupWindow, the ClientWindow has been

created, has loaded the specified bitmap, and has sized itself to fit the bitmap's dimensions. TAboutBox.SetupWindow then undertakes some tedious calculations so that the gray group box will frame the ClientWindow, the dialog will frame the group box, and everything will be centered horizontally in the dialog.

The last notable method built into TAboutBox is the ShowCredits method. This method will be called when the About Box dialog receives a button-click notification from the hidden &I button in the dialog template. As you can see in Figure 3, ShowCredits simply notifies the CreditWindow that it's *show time!*

In the world of music, nobody knows the score like Yamaha. And now, so can you. With Yamaha's Hello!Music!

You don't have to be Stravinsky. You don't even have to be Einstein. Everything you need to add the drama, the power, the emotion of music to any multimedia project is right here.

Just plug and play.

Better yet, you don't have to add a card or give up an expansion slot. You simply plug Hello!Music! right into a serial port. Then you play.

From strings to woodwinds to grunge guitar.

Inside the Hello!Music! CBX-T3 Tone Generator (that slim little unit to the right of the CPU)

are 192 sampled instrumental sounds which conform to the General MIDI standard. All yours with a few clicks of the keyboard, or a few clicks of the mouse.

What's more here's an audio input terminal to let you bring in sound from any source, be it CD, cassette player, radio or television. Plus all the software you need to mix everything together, for output at the same level of quality as CD audio.

MIDI to the max.

Since Hello!Music! is a true MIDI interface, it can connect you and your computer to hundreds of MIDI devices. As well as let you use any pre-programmed MIDI music file on the market.

From music charts to pie charts.

If you're a musician, Hello!Music! can be your voice.

If you're someone who simply wants to make last quarter's sales figures look and sound like the gods themselves had smiled on them, Hello!Music! is your instrument.

Hello!Music! from Yamaha.

If you'd like to bring a whole new standard of multimedia sound to your work, this is the key.

YAMAHA

Consumer Products Division
714-522-9240



Copyright 1993 by Yamaha Corporation of America. All rights reserved.
IBM is a registered trademark of International Business Machines Corporation.

Now Yamaha brings everything we know about music to a whole new keyboard.

TCREDITWINDOW TCreditWindow actually does all the work of scrolling the credit text and painting an innocuous bitmap facade. Most of the time it just sits there, innocently displaying the bitmap. When the user activates the credit list (via the hidden button's hotkey), the CreditWindow starts a timer message to itself and begins scrolling the bitmap up out of view and printing the credit text strings, centered, on the window. With each timer message received, the bitmap is rolled up a little further and more text is displayed. When all the text has scrolled by, the bitmap is gracefully scrolled back into view from the bottom, as though the whole contraption were on a continuous loop of paper running through a player piano.

The Init constructor loads the bitmap into memory using the provided resource name. Note that Windows lets you identify a resource by a string *or* by an integer ID. When writing code that handles resource names, therefore, you must not forget that the string pointer you're given might not be a pointer at all, but instead might be an integer resource identifier. If the pointer is an integer identifier, the

selector (high word) will be zero. Dereferencing a pointer with a zero selector will cause a General Protection Fault and crash your program! Thus you must remember not to treat this resource name as a string pointer unless you check that the pointer's selector (high word) is non-zero.

The bitmap's dimensions are retrieved by calling `GetObject`. The CreditWindow will resize itself to these bitmap dimensions in its `SetupWindow` method. Finally, the constructor makes note of the height of the system variable-pitch font—the font that will be used to display the credit text. The constructor also keeps a pointer to the constant array of strings and notes the size of the array.

The `GetClassName` and `GetWindowClass` methods work as a pair. `GetWindowClass` changes some of the default window class attributes for the CreditWindow. It requests the `cs_ByteAlignWindow` class style in order to make the CreditWindow's in-memory screen image start on an even byte boundary. `BitBlt` operations are a bit faster on byte-aligned windows than on nonaligned windows, and the CreditWindow will be

doing lots of `BitBlt`ing during its text-scrolling operation. The performance difference is noticeable on slower video cards running in 16-color mode (4 bits per pixel). `GetWindowClass` also sets the class background brush to a black brush. This black background won't be visible while the bitmap is displayed, since the window is the same size as the bitmap, but it will form the background for the scrolling credit text.

In order to register and use this altered window class with Windows, you must make `GetClassName` return a new, unique window class name. Whenever you alter the window class record, you must provide a new class name. You should be careful when thinking up new window class names, too: Initially, I had `GetClassName` return `OWLAboutCredits`. The name is fine, but bear in mind that window class names are easy for others to find and browse using such Windows debugging tools as `WinSight`. If you're trying to conceal some detail of your program's implementation—such as the very existence of hidden credits—it's not too bright to announce it by the window class name. It's better to use the

DEMOPROG.PAS and DEMOPROG.RC

Complete Listing

A

```
{.....}
{  About box demo program          }
{  Copyright (c) 1993 by Danny Thorpe }
{                                  }
{  for Borland Pascal 7.0          }
{.....}

program Demo;

uses Winprocs, Wintypes, OWindows, BWCC, About;

{$R demo.res}

const
  cmAbout = 101;
  idBitmap = 200;

  CreditText: array[1..7] of PChar = (
    '',
    'This is where you would',
    'put your own list of',
    'names or secret message',
    'to reward the users who',
    'discover this.',
    ''
  );

type
  PDemoMainWindow = ^TDemoMainWindow;
  TDemoMainWindow = object(TMDIWindow)
    procedure cmAbout(var Msg: TMessage); virtual cm_First + cmAbout;
  end;

  TDemoApp = object(TApplication)
    procedure InitMainWindow; virtual;
  end;

procedure TDemoMainWindow.cmAbout(var Msg: TMessage);
begin
```

```
Application^.ExecDialog(New(PAboutBox,
  Init(@Self, 'Demo About Box', PChar(idBitmap), CreditText)));
end;

procedure TDemoApp.InitMainWindow;
begin
  MainWindow := New(PDemoMainWindow, Init('Demo App',
    LoadMenu(HInstance, 'MainMenu')));
end;

var App: TDemoApp;
begin
  App.Init('Demo');
  App.Run;
  App.Done;
end.
```

B

```
#include "\bp7\units\owindows.inc"

MAINMENU MENU
BEGIN
  POPUP "&File"
  BEGIN
    MENUITEM "E&xit \tAlt-X", CM_EXIT
  END

  POPUP "&Help"
  BEGIN
    MENUITEM "&About...", 101
  END
END

200 BITMAP "chess.bmp"
```

Figure 5: A minimal demo program (A) and resource script (B) that display an About Box.



TCP/IP

We've been in the business of networking DEC comput-

ers for over 10



years,

so we

know just how to fulfill the promise of AXP

on your business network. A

feature-rich, high-perfor-

mance suite of TCP/IP applica-

tions, PathWay

Open VMS

enables every-

one to access

and share the powerful resources of Alpha AXP —

from anywhere in the company. Fully compatible with

Pathworks, our

cost-effective

and design-

efficient modu-

lar architecture

lets you buy

what you need

now, and add

more later. We

understand the

demands for

performance,

reliability, and

service in busi-

ness, and we

deliver. Call us

today for your free

30-day evaluation copy.

PATHWAY. OPEN VMS TO THE REST OF YOUR BUSINESS.

TCP/IP

1 ▲ 8 0 0 ▲ 8 7 2 ▲ 8 6 4 9

IN CALIFORNIA 1 800 962-8649 OR 415-962-7202

FAX 415 962 0286 sales@twg.com

IN CANADA 519 747 9900 IN EUROPE 32 27 18 0311

WOLLONGONG

STRAIGHT TALK. SOLID SOLUTIONS.

CIRCLE 207 ON READER SERVICE CARD

©1993 The Wollongong Group, Inc. All rights reserved. All trademarks are property of their respective holders.

less revealing class name OWLAboutBitmap instead.

TCreditWindow.SetupWindow resizes the window to fit the bitmap dimensions. Note that this method gets called before TAboutBox.SetupWindow really starts its work. TAboutBox.SetupWindow calls inherited SetupWindow, which in an ancestor's method calls the SetupWindow methods of all the child windows (that is, CreditWindow) before returning to TAboutBox.SetupWindow. This is worth noting because TAboutBox.SetupWindow's layout code assumes the CreditWindow is in final form, matching the bitmap dimensions. The assumption is fine, but it may not be obvious that TCreditWindow.SetupWindow is called immediately prior to the execution of TAboutBox's layout code.

The Paint method displays the bitmap when the CreditWindow is in nonscrolling mode and displays the scrolling bitmap and text when in scrolling mode. This method is all nuts-and-bolts output code, so it should require no further comment.

ShowCredits starts the scrolling action by initializing a timer message for the CreditWindow. Those timer messages get routed to the WMTimer method. For each timer message received, WMTimer increments the scroll offset counter and forces a new paint message by calling ScrollWindow. If the scroll offset counter indicates that the scroll has come full circle, WMTimer kills the timer message and the CreditWindow grows quiet once again.

As a last item of note, TCreditWindow has a WMDestroy method that re-

sponds to wm_Destroy window messages. As the Done destructor is to the Init constructor, WMDestroy is to SetupWindow: WMDestroy is the last point of execution in an OWL object at which the object's HWindow handle is valid. SetupWindow is the first place the HWindow is valid.

What would happen if the user clicked on the OK button in the AboutBox dialog while the credit list was scrolling? Or closed the dialog using the system menu? TAboutBox would shut itself down, dispose of its child window objects, and then dispose of itself. If the CreditWindow were still scrolling, however, its timer message would still be "live" and should be killed as part of a clean shutdown of the window. TCreditWindow.Done would be called as the last part of the shutdown, but note that by *that* point HWindow is no longer a valid handle. The Windows window is already gone, and to kill the timer message you need that window handle. The last opportunity to use HWindow is in the WMDestroy message handler, and *that's* where TCreditWindow kills any active timer.

So much for the About Box and its special components. Now let's see what it looks like and how it works. Figure 5A is the source listing for a minimal test program; and Figure 5B is that test program's resource script, consisting of a menu and a bitmap. When you compile this program, run it, and pull down the Help: About menu, you'll get the About Box shown back in Figure 2. Hitting the I key starts the credit text scrolling, a snapshot of which can be seen in Figure 6. Mission accomplished!

The Borland Pascal compiler compiles this About Box unit down to about 2,300 bytes of code. That's how much larger your finished application will be for including this About Box with its hidden credit window. Not only is 2K small in itself, but it's also virtually unnoticeable at a time when most commercial Windows programs have .EXE files that are well over 100 or 200K. And once you have established a sound base of code such as this basic About Box, you can em-

bellish and add new behaviors without adding much more machine code.

The strings of credit text that are given to the About Box *will* take up space in the program's code or data segments. As an alternative, you could put the string list out in the program's resource file—after all, a string table is a Windows resource. The reason that this alternative is undesirable is that resources are very easy to view and edit these days, so it's not a good idea to put somewhat sensitive information (like names) in an easily viewable string table. You certainly wouldn't want someone to slip his own name or text into your string table! Further, plain strings are easy to spot in the .EXE file if you use a binary file editor. To keep prying eyes out of your sensitive program data, you would need to employ some sort of encryption system, but that is beyond the scope of this article.

The files that accompany this article can be downloaded from the Programming Forum on PC MagNet, archived as ABOUT.ZIP. (See the "Downloading Utilities" sidebar in this issue's Utilities column for instructions.) The Pascal source is written for Borland Pascal 7.0 and uses many of Version 7.0's new language enhancements. A separate version of the Pascal source code is also provided for TPW 1.0 and TPW 1.5 owners. The C++ source is written for BC++ OWL Version 3.1.

Credit screens are as much a part of the software culture as huge linebackers mouthing "Hi Mom!" to a roving television camera are a part of football culture. Creative animated credit screens often evoke the same reactions as a football player spiking the ball in the end zone and briefly strutting around the field: Many fans find it entertaining, some folk consider it unprofessional, and some players go a bit overboard. If you've finally reached the stage of putting the last flourishes on a new software product, take the time to unwind every now and then; learn to laugh at yourself. Spike the ball, do a little dance, strut a few steps. You've earned it. □

DANNY THORPE IS A SENIOR QUALITY ASSURANCE ENGINEER IN THE PASCAL COMPILER GROUP AT BORLAND INTERNATIONAL.



Figure 6: A snapshot of the About Box dialog while the credit text is scrolling by.

ProTracer. Where the qualities of a laser printer meet the output of a large format plotter.

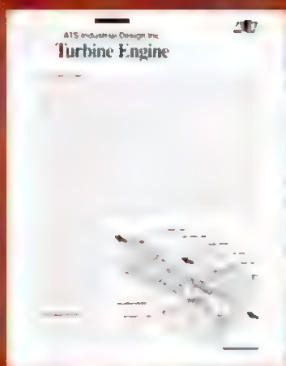
C-size (17" x 22")



B-size (11" x 17")



A-size (8.5" x 11")



Laser printers offer so much.

Like high quality output, speed, desktop convenience and, of course, a low price. Large format plotters, on the other hand, give you the output size you need for certain drawings and applications. What we've done is pulled all of these features together to create ProTracer™ — a personal printer and plotter that produces A, B, and C-size output at an impressive 360 dpi resolution.

FEATURES INCLUDE:

- ▶ High performance Canon® inkjet engine
- ▶ Fast, Intel i960™ processor—drawings that take over one half hour on pen plotters take as little as five minutes on ProTracer!
- ▶ Optional accessories including a new, faster HP-GL® language emulation card, PostScript® language emulation, memory expansion boards, and sheet feeders
- ▶ Full vellum capabilities
- ▶ Unsurpassed customer service — 60-day money back guarantee, one year warranty, and unlimited technical support



- ▶ Customized ADI® and PADI® drivers for AutoCAD®
- ▶ Epson and ProPrinter emulations

\$1349



- ▶ ProTracer base unit
- ▶ HP-GL emulation card plus memory
- ▶ 5 MB memory

\$1999



- ▶ ProTracer base unit
- ▶ PostScript language emulation card
- ▶ 8 MB memory

\$2408



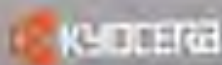
For the bigger picture, call
Pacific Data Products at (619)
625-3573, Fax (619) 552-0889.



**PACIFIC DATA
PRODUCTS**

© 1991 Pacific Data Products, Inc. All rights reserved. In Europe, call 01 51 61 47 56 09.
The Data Products, Inc. logo and product names are registered trademarks of their respective manufacturers. Image courtesy of
ProTracer uses PostScript® the advanced imaging Operating System
PostScript is a registered trademark of Phoenix Technologies Ltd.
Data Products, Inc.

**We won the awards.
But you get the prize.**



Kyocera Electronics Inc.
111 Parkside Road, Danbury, CT 06811

**Ecosys
Network
Printers**



1992
WINNER
PC Magazine Award
for Technical Excellence



Printers Recognized by PC Magazine
Kyocera Electronics, Inc.

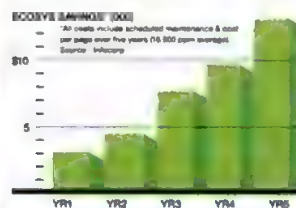
It's official! The unbeatable cost savings, unparalleled productivity and environmental safety of the ECOSYS FS-1500A 10 page per minute network printer has earned it the industry's most coveted awards.

Now, Kyocera introduces another winner.

The ECOSYS FS-3500A 18ppm network printer.

Savings so high... Ecosys pays for itself.

Unbeatable savings that add up to hundreds of dollars for the desktop user and thousands of dollars for the network user... per printer, per year. Just compare the operating cost for yourself. Less than a penny per



page for the ECOSYS FS-3500A vs. two to three times the cost for those polluting cartridge printers. A cost so low, you can actually print an original for less than the cost of a copy.

Count all the Ecosys award-winning advantages.

Network compatibility. ECOSYS offers instant plug-in connectivity to Ethernet, Token Ring and AppleTalk... all without the need of a print server.



Speed. ECOSYS not only delivers an exceptional 18 pages per minute... its advanced RISC processor cuts printing time way down, even with complicated graphics.

Expandability. ECOSYS options include two 500 page paper drawers for your large volume, a duplexing unit, plus the only 15-bin sorter/stacker/electronic mailbox available anywhere.

Custom applications. Uniquely Ecosys.

Quick Forms. only ECOSYS offers this special feature allowing the creation of customized graphics—scalable bar codes, fonts, forms, letterhead or company logos. Store up to 16MB of



Quick Forms on two IC Cards for easy access for any application.

No-cartridge technology.

The environment wins. And you win, too. ECOSYS no-cartridge technology won't add to the 16 million non-biodegradable cartridges polluting the landscape, every year.

To find out more about ECOSYS... call
800-2-ECOSYS (800-232-6797)

*Saving the Earth
is the best investment
you can make.*

ECOSYS
a-Si PRINTERS™



FS-3500A 18 ppm



FS-1500A 10 ppm

CIRCLE 370 ON READER SERVICE CARD

Bring Your Desktop to Life with ICON ANIMATOR

BY PHILIP B. ESKELIN, JR.

Not only do icons add fun to your Windows environment, they also make minimized programs easier to recognize. With programs like IconDraw, Borland's Resource Workshop, Norton's icon editor, or with our own IKE utility (*PC Magazine*, March 26, 1991), you can customize your icons, but we decided to go a step further. Until now, icons have remained static and inert. Wouldn't it be nice to see the pencil scribble back and forth when you minimize NOTEPAD?

ICON ANIMATOR is a Windows 3.1 utility that gives you the ability to bring an icon to life when you minimize a running application, by displaying a timed sequence of icon frames in place of the usual static icon. Up to 16 animation sequences can be used at once, each associated with a different application. The frame rate (the amount of time between frames) for each sequence is user-selectable, and different animated icons can run at different speeds.

The easiest way to get a copy of ANIMATOR is to download the archive ANIMAT.ZIP from the Utilities/Tips Forum on PC MagNet, as explained in the sidebar, "Utilities by Modem." ANIMAT.ZIP contains the executable program and the complete C-language source code, including resource files, header files, and icon files. (You can also download just the ANIMAT.EXE executable file itself.) To recompile the program after making changes of your own, you'll need either the Borland C++ 3.1 compiler or the Microsoft C 6.0 compiler and the Windows SDK.

As an alternative to downloading, you can get a copy of the executable and its source files on-disk, without charge. Simply send a postcard or a fax request specifying

the program name and desired disk format, together with your name and address, to: Katherine West, Utilities, *PC Magazine*, One Park Ave., New York, NY 10016-5802. The fax request number is 212-503-5799; *no phone calls*, please.

Before you can put ICON ANIMATOR to work, of course, you must create the individual images (the frames) that will comprise the animation sequence. For this you'll need a separate icon edi-

*Until now, icons
have been static and inert.
Now, using your favorite
icon editor and this utility,
you can animate them,
running up to 16 animations
at once.*

tor. In addition to the editors mentioned at the outset, any number of public domain icon editors are available for downloading from various bulletin boards.

In selecting a suitable icon editor, look for two things: the ability to draw an icon *transparently*, that is, without a background of its own; and the ability to save the drawn image under a filename, move the entire image a few pixels and save it under a new filename, move it and save it again, and so on. This will eliminate the need to redraw the entire icon for each frame of the animation sequence.

As illustrated by the bouncing ball sequence shown in Figure 1, you might begin your frame sequence by creating an image with the ball at the top of the editing area. Save this first frame as

BALL1.ICO. The next frame, to be saved as BALL2.ICO, will use the same image, but this time it will be drawn two pixels lower, and so on, until the ball reaches the bottom of the editing area. (Typically, the editing area is 32 by 32 pixels overall.) If the ball is only to bounce up and down, you can then re-use your previously drawn icons in reverse order to show the ball traveling back up to the top of the frame.

Including a numeral as part of each .ICO filename will help you keep their order straight when you are ready to put them into an animation sequence (an .ANM script file) for ICON ANIMATOR to run. To get you started, I've included the .ICO and .ANM files for the bouncing ball as part of the self-extracting archive you download from PC MagNet.

USING ICON ANIMATOR After downloading ANIMATOR.EXE, copy it to the drive and directory from which you want to access it under Windows. There are several ways to run the program. As with most Windows applications, you can run

Top 10 Utilities

Rank	Utility
1	DIRMATCH - Compare 2 directories
2	BAT2EXEC - Batch file compiler
3	CHKFRAG - Checks fragmentation
4	PCSPool - Print spool utility
5	INCTRL - Installation control
6	BUGS - Windows 3.1 screen saver
7	STRINGS - Enhance batch files
8	WPRINT - Print in Windows 3.1
9	CLIPST - Extend the clipboard
10	PCREM2 - Access a remote PC

This list is based on the total number of downloads each utility has had on PC MagNet over the past 12 months. To download these files, type GO ZNT:TIPS.

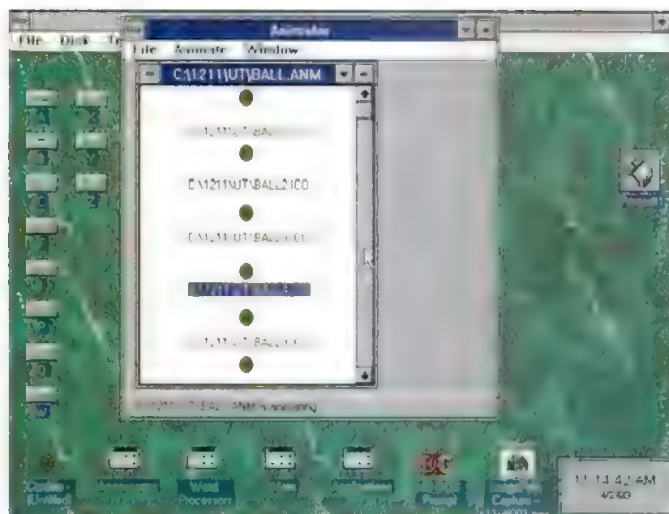


Figure 1: These sample frames (.ICO files) and the script (an .ANM file) for ICON ANIMATOR to run them can be downloaded as part of ANIMAT.ZIP.

it using the File | Run menu selections. If you don't want ICON ANIMATOR to start up automatically, you can put it in any group you wish. Since you'll probably want some of your regular programs to use animated icons automatically, however, you'll normally install ANIMATOR in your Startup Group.

To do this, simply highlight the Startup Group in Program Manager, select the File | New menu command, choose Program Item, and click OK. Fill in an icon title (in this case, *Animator* would be the obvious choice) in the Description edit box, and enter the complete path and executable filename on the Command Line. As your working directory, specify the directory in which you keep ANIMATOR's frame (.ICO) and script (.ANM) files. Finally, you'll want to check the Run Minimized box so that ANIMATOR won't come up atop your Program Manager each time you start Windows.

Once you have installed the utility and produced a series of images with your icon editor, you're ready to use ANIMATOR to create a script (.ANM) file. When you run ANIMATOR and choose File | New, an <Untitled> window will appear. Select Animate and choose Append Icon To End Of List. ICON ANIMATOR will now display a File Selection dialog box that contains your working directory. Double-click on the .ICO file that contains the image that you want to place first in your animation

sequence (BALL1.ICO, for example). ICON ANIMATOR will display this file—complete with image and full pathname—in the window in which your script file is being created.

If you should decide to add a second image to your animation sequence (BALL2.ICO, for instance), simply repeat the process: Choose Animate, then select Append

List, double-click on the correct .ICO file, and ANIMATOR will display it in the <Untitled> window as the second item.

Either during or after creation of an .ANM script, you may find it necessary to make editing changes. If you need to edit a script you have already created, simply select File | Open. ICON ANIMATOR will present a list of all the .ANM files in your working directory. Double-click on the script you want to edit and ANIMATOR will display it in the window. Obviously, if you're in the process of creating a script, it will be displayed already.

Suppose, for example, that after correctly making BALL1.ICO the first frame in your sequence, you accidentally

skip BALL2.ICO and make BALL3.ICO the second frame in the sequence. If you double-click on BALL3.ICO to highlight it, and you then select Insert Icon into List from the Animate menu choices, you'll be able to repair your omission. To remove an icon frame file from the list, simply highlight it and select Delete Icon from List from the Animate menu.

ICON ANIMATOR also supports the File Manager's drag-and-drop protocol as an alternate way to insert or append icons. To insert an icon or a list of icons into a specific position, select the file(s) from File Manager (either with the mouse or by choosing File | Select Files), and drag the file atop the desired position in the icon script list. Dragging past the end of the list and releasing the left mouse button appends the file to the end of the list.

After your list of frame filenames is complete, you have but two remaining tasks. First, you must specify the *frame rate*; that is, the time interval to be inserted between frames. Second, you must associate the animation sequence with an application. You execute both these configuration options by selecting Settings from the Animate menu. The default time interval between frames is 100 milliseconds, but you can choose any value between 20 and 20,000 ms.

There are two ways to associate or link an animation sequence to an application. If the application is already running, press the Link to Running Task button;

BALL.ANM Complete Listing

```
[Info]
; 100 milliseconds between frame switches.
TimerInterval=20
; Number of icons below.
NumIcons=6
; Automatically animate upon opening if LinkFile is running
AutoAnimate=1
; File to link animation to.
LinkFile=G:\WIN\notepad.exe
;
;
[Icons]
IconFrame1=G:\WIN\PC\BALL1.ICO
IconFrame2=G:\WIN\PC\BALL2.ICO
IconFrame3=G:\WIN\PC\BALL3.ICO
IconFrame4=G:\WIN\PC\BALL4.ICO
IconFrame5=G:\WIN\PC\BALL3.ICO
IconFrame6=G:\WIN\PC\BALL2.ICO
```

Figure 2: ICON ANIMATOR uses this file to animate the bouncing ball icons. Note that in the [Icons] section the pathname should be changed to reflect the directory in which you keep your .ICO and .ANM files.

"Recommended."
Jerry Pournelle, Byte, July 1992

Inside Out



SupraFAXModem V.32bis Internal
\$349.95 Dos/Windows

SupraFAXModem V.32bis External
\$399.95 Stand Alone
\$439.95 Dos/Windows

The Best Choice: SupraFAXModem



Inside or Out, now you can choose the hot-selling SupraFAXModem technology that best fits your computer. Either way, Supra can turn your PC into a communications powerhouse!

SupraFAXModems come in a wide range of models, from our budget-minded SupraFAXModem 24/96i to the fastest fax modem available: the SupraFAXModem V.32bis. Whichever model you choose, you will get Supra's proven technology and reputation for high-quality, reliable modems.

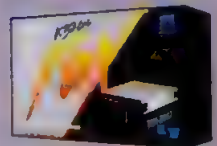
Supra modems are designed for novice and expert communicators alike. Whether you use DOS™, Windows™, or a Macintosh™, we've got a package for you — and our



Supra Corporation

CIRCLE 183 ON READER SERVICE CARD

packages include everything you need. Plus our easy-to-follow Getting Started manuals will help you install your modem and start using it in just a few minutes! Imagine sending and receiving perfect faxes, exploring the world of on-line databases, or retrieving an important work file — all from the convenience of your desk. And advanced users will appreciate the error-correction and data-compression features that can save you money!



No matter what your needs, a Supra modem is your best choice. Call us today at **1-800-727-8417**, and find out why!

MODEL	INT./EXT.	FAX	DATA	V.42bis & MNP 5	MAX THROUGHPUT
SupraFAXModem V.32	E	9600 S/R	9600	yes	58,400
SupraFAXModem 24/96i	I	9600 S/4800R	2400	w/ software	9600
DOS Package					
				Windows Package	

All trademarks belong to their respective companies. 7101 Supra Drive S.W., Albany, OR 97321 USA • 503-967-2410 • Fax 503-967-2401



CALLER ID
AVAILABLE NOW



The NotifyProc Callback Function

```

////////////////////////////////////
// NotifyProc() - Everytime TOOLHELP determines that a task is
// exiting or starting, it notifies ANIMATOR via this callback function.
// ANIMATOR immediately posts the message to get the condition into the
// queue of a window.
////////////////////////////////////

BOOL _export CALLBACK NotifyProc (WORD wID, DWORD dwData)
{
    switch (wID)
    {
        case NFY_EXITTASK:
        {
            PostMessage (_hwndFrame, WM_COMMAND, IDN_EXITTASK, 0L);
            break;
        }

        case NFY_STARTTASK:
        {
            PostMessage (_hwndFrame, WM_COMMAND, IDN_NEWTASK, 0L);
            break;
        }

        default:
            return FALSE;
    }
    return TRUE;
}

```

Figure 3: ICON ANIMATOR is notified, via this callback function, when a task is starting or exiting.

otherwise, press Link to an Executable File. Your choice will be displayed to the right of the words Linked to File. To avoid losing the linkage when ANIMATOR is closed, you should also check the Automatically Animate check box.

After you have linked an animation sequence to an application, you can see it work by selecting Go! from the Animate menu and then minimizing the application. At this point, however, your script has not yet been saved, so don't choose File | Close. Rather, select the File | Save (or File | Save As if you want a new filename for your script) to record what you have done.

The Stop and Go! choices on the Animate menu form a toggle whose status is reflected by the status bar at the bottom of the main ANIMATOR window. ICON ANIMATOR also has a Window drop-down menu that contains the standard Cascade, Tile, Arrange Icons, and Close All selections. It also shows the command line for all open ANIMATOR windows. Selecting a script window title in the menu activates that specific script.

Once you have prepared the animation scripts, add the ones you want to use regularly to the ANIMATOR Command Line as parameters. To do this, simply highlight ANIMATOR in your Startup

Group, select File | Properties from the Program Manager menu, and add the animation script filenames to the Command Line. For example, if you keep ICON ANIMATOR and its related files in the PCMUTILS subdirectory of your Windows directory on drive C:, enter

```
C:\WINDOWS\PCMUTILS\ANIMATOR.EXE
BALL.ANM
```

on the Command Line. To load more than one script, just enter it thus:

```
C:\WINDOWS\PCMUTILS\ANIMATOR.EXE
BALL.ANM BELL.ANM
```

Note: In order for any program you run to have its icon replaced with its animating icon automatically, you *must* put the script file on the command line as a parameter.

INSIDE ICON ANIMATOR Although the user works with ANIMATOR primarily as if it were a simple script editor, to execute its tasks the utility needs timers, notification callbacks, owner-draw list box manipulation, and window enumeration. For example, the user can simply open an animation script that will automatically animate when its linked executable is loaded. As detailed more fully below,

to accomplish this ICON ANIMATOR must call the TOOLHELP NotifyRegister() function to install a notification callback, which signals when a task starts or exits.

My first version of ANIMATOR simply listed the full pathname and filename of each icon added or inserted into the list. After some consideration, however, the desirability of displaying the icons that make up the script made me decide to maintain an owner-draw list box. Having this list box control in the client window of each script meant adding a handler for the WM_DRAWITEM and WM_MEASUREITEM messages. The rest of the code concerned with the list box—such as the selection notification (receiving the LBN_SELCHANGE message) and insertion/deletion of items (sending the LB_ADDSTRING and LB_INSERTSTRING messages) from the list box—turned out to be the same as for a non-owner-draw list box.

Although ICON ANIMATOR has to be able to time multiple animation sequences, the use of a single timer was the most efficient way to go. (The SetTimer() function is discussed extensively below.) Windows has a limited number of timer events available to the system, so it is imperative that ANIMATOR be aware of the fact that its purpose is to run in conjunction with up to 16 other applications. I chose 16 thinking that this would probably be enough for most people and because supporting more would overtax the system. (ICON ANIMATOR itself is a one-instance application. If it were not, you could all-too-easily overload your system with multiple groups of 16 animations.)

When each animation script is opened, the animation's ANIMI-STRUCT (the attached data structure that keeps track of its settings) receives a countdown value that is initially set to the user-selected frame rate (the interval between frames of the animation sequence). Every time the timer fires off an event to the ANIMATOR timer callback, it decrements this countdown value by the amount of time elapsed between events. When this countdown reaches zero, ICON ANIMATOR changes the icon in the class data structure for the application and invalidates all of the in-

The TimerCallback() Function

```
#include "animator.h"

static char szClass1[32];
static char szClass2[32];

HICON NEAR PASCAL      GetNextIcon (short);
VOID NEAR PASCAL      DrawIconic (HWND, HICON);

// TimerCallback() - this function is called by the timer, which fires
// off every twenty milliseconds (or close to that). It is not exact
// since Windows is message-driven. It steps through the animStruct
// and figures out whether or not it is worthy of animation, and if it
// and the user has chosen "Go!", then it decrements a time counter.
// When this time counter has reached 0 or less, we re-initialize the
// counter and change the icon. This way, all of the animations
// currently animating can use one timer.

VOID _export CALLBACK TimerCallback (HWND hWnd, UINT uMsg,
    UINT uIDEvent, DWORD dwTime)
{
    short i;

    // For all eight possible animation sessions...
    for (i=0; _PageFlags && i<MAXANIMATIONS; i++)
    {
        if (!IsWindow(HWNDANIM(i)) || !ISANIMATING(i) || !HWNDTARGET(i))
        {
            continue;
        }
        // If the countdown is at 0...display the next icon:
        if (!COUNTDOWN(i))
        {
            HICON hIcon = GetNextIcon(i);

            SetClassWord (HWNDTARGET(i), GCW_HICON, hIcon);
            InvalidateAll (HWNDTARGET(i), hIcon);
            SET_COUNTDOWN (i, TIMEINT(i)-(TIMEINT(i)%MINTIME));
        }
        // Otherwise, decrement the countdown by MINTIME amount.
        else
        {
            SET_COUNTDOWN (i, COUNTDOWN(i)-MINTIME);
        }
    }
}

// GetNextIcon() - shifts through the list of icons.

HICON NEAR PASCAL GetNextIcon(short i)
{
    if (HICONS(i)[INDEX(i)+1] == (HICON)NULL)
    {
        SET_INDEX (i, 0);
    }
    else
    {
        SET_INDEX (i, INDEX(i)+1);
    }
    return HICONS(i)[INDEX(i)];
}

// InvalidateAll() - Enumerates the sibling instances of a module that
// is loaded, making all of the instances invalidate themselves.

VOID WINAPI InvalidateAll (HWND hWnd, HICON hIcon)
{
    HWND hWndNext;

    if (!IsWindow(hWnd)) return;

    GetClassName (hWnd, (LPSTR)szClass1, sizeof(szClass1));

    for (hWndNext = GetWindow((HWND)hWnd, GW_HWNDFIRST);
        hWndNext;
        hWndNext = GetWindow(hWndNext, GW_HWNDNEXT))
    {
        GetClassName (hWndNext, (LPSTR)szClass2, sizeof(szClass2));

        if (lstrcmp ((LPSTR)szClass1, (LPSTR)szClass2) == 0)
        {
            DrawIconic(hWndNext, hIcon);
        }
    }

    // DrawIconic() - If iconic, it goes a head and tells the minimized
    // window to redraw its non-client.

    VOID NEAR PASCAL DrawIconic (HWND hWnd, HICON hIcon)
    {
        if (IsIconic(hWnd))
        {
            RedrawWindow (hWnd, (LPRECT)NULL, (HRGN)NULL,
                RDW_ERASE|RDW_FRAME|RDW_INTERNALPAINT|RDW_INVALIDATE);
        }
    }
}
```

Figure 4: The TimerCallback() function and its supporting functions, GetNextIcon(), InvalidateAll(), and DrawIconic(), handle all timer events in ICON ANIMATOR.

stances currently minimized. Every instance has in its class data structure an entry that stores a handle to an icon image to be displayed when the application is minimized. ICON ANIMATOR uses the SetClassWord() function to change the icon handle for the application:

```
SetClassWord (HWNDTARGET(i),
    GCW_HICON, hIcon);
InvalidateAll (HWNDTARGET(i), hIcon);
SET_COUNTDOWN (i, TIMEINT(i)
    -(TIMEINT(i)%MINTIME));
```

Once ICON ANIMATOR finishes its drawing, it resets the countdown back to the timer interval quantity that is specified by the user. The code above shows the entire contents of the timer callback function.

GETTING/SETTING WINDOW BYTES When programming a Windows application that supports MDI, window extra bytes can be very valuable. In ICON ANIMATOR, 6 extra bytes are specified in MAIN.C to store the list box window handle, an integer indicating the window number, and a Boolean used when the user saves the animation. WW_HWNDLIST, WW_WINDOWNUM, and WW_ISDIRTY, respectively, specify the offsets into the extra window byte area used to store these three values.

In the WinMain() function, when you register application-specific classes, you will notice that one of the fields in the WNDCLASS data structures is named cbWndExtra. This is an integer that specifies the number of bytes it should allocate following the window structure (in-

ternal to Windows). This area is conventionally used by the application to store window-specific data. To access the byte values allocated, use a positive byte offset as the index, starting at 0 for the first byte and extending upward in value. ANIMATOR allocates 6 bytes, or three words, for each MDI child window created. All values stored are words. The GetWindowWord(hWnd, nIndex) and SetWindowWord(hWnd, nIndex, wNewWord) functions are then used to get and set these values, specific to each MDI child window. For instance, any time a user alters anything in the current animation, ANIMATOR sets the value at offset WW_ISDIRTY to TRUE. When the user tries to close ICON ANIMATOR, it checks WW_ISDIRTY by calling GetWindowWord (hWnd, WW_IS-

DIRTY), and displays a message box if the return value was TRUE, asking the user if he or she wants to save the changes.

When an application calls `CreateWindow()` and creates a new window based on a previously registered class, Windows allocates a block of memory to store the information about the individual window. This memory block, or structure, is accessed by the `GetWindowWord()` and `SetWindowWord()` functions. The index value specified accesses a part of the structure (as defined in `WINDOWS.H` included with the SDK):

Identifier	Index
GW_HWNTPARENT	-8
GW_HINSTANCE	-6
GW_WNDPROC	-4
window extra bytes	0+ as defined

The window extra bytes that are defined by the programmer start at 0. Those that are defined in each window class by Windows have negative values, however. For the record, the long values start after `GW_HWNTPARENT` and decrease by 4 instead of by 2 (words are 2 bytes, longs are 4 bytes). `GetWindowLong()` and `SetWindowLong()` return long values that correspond to the specified index.

FILE I/O USING .INI FUNCTIONS Instead of storing animation script information in binary format, I chose to implement ANIMATOR with profile file I/O (that is, as an .INI file) in order to illustrate its portability and ease of use. Windows supplies the `GetPrivateProfileInt()`, `GetPrivateProfileString()`, and `WritePrivateProfileString()` functions for all .INI-based file I/O. Each function reads and writes from a private .INI file. This means

that the application calling it provides its own file name. Functions of the same name without the Private read and write to the general `WIN.INI` file.

Each animation script file contains the

TOOLHELP.DLL opens up considerable functionality and publicizes a number of undocumented functions.

frame rate, whether or not `AutoAnimate` is active, the linked executable file name, the number of icons in the animation, and a list of the icon path and filenames of each icon in the animation. Figure 2 shows the contents of `BALL.ANM` and how the profile strings are defined.

ICON ANIMATOR also saves its current position on the desktop when it is closed. It does this in `MAIN.C` by calling the `GetWindowPlacement()` function, which fills a `WINDOWPLACEMENT` structure. (Note that the call will fail if you do not fill the length element in the `WINDOWPLACEMENT` data structure before calling the `GetWindowPlacement()` function. This should be, but is not, documented in the Windows 3.1 SDK.) The information in this structure is written to the `Position=` keyname under the `[Animator]` section of the `WIN.INI` file. The `WINDOWPLACEMENT` structure contains such information as state of the window, x and y position when minimized, x and y position when maximized, and window rectangle of the window when in restored state.

CREATING A NOTIFICATION CALLBACK `TOOLHELP.DLL` opens up considerable functionality and publicizes a number of previously undocumented functions. It contains functions that provide information about tasks, memory objects, classes, and modules. Among its many useful functions, two are of direct interest to ANIMATOR: `NotifyRegister()` and `NotifyUnRegister()`. (The Windows 3.1 SDK contains a full explanation of these functions.) The following shows how the callback function is registered:

■ Utilities by Modem

The *PC Magazine* utilities are available by modem from PC MagNet, a ZiffNet service hosted by CompuServe.

To find the phone number nearest you, set your communications software to 300, 1,200, 2,400, or 9,600 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex, then dial 800-346-3247 with your modem.

When the modem connects, press Enter. At the `HOST NAME` prompt, enter `PHONES`. Follow the menus and note the number closest to you. Or you can call 800-635-6225 (voice) and follow the instructions and note the number.

To obtain the current issue's utility free of charge: Dial the local number; at the `HOST NAME` prompt, type `CIS`; and at the `USER ID` prompt, enter 60116,1. Then at the `PASSWORD` prompt, enter `PCMAG UTIL`.

To join ZiffNet: At the `USER ID` prompt, type 177000,5000. Then, at the `PASSWORD` prompt, enter `PC* MAGNET`. Finally, at the `ENTER AGREEMENT NUMBER` prompt, type `PCMAG93`.

Register your name and enter your American Express, MasterCard, or Visa number. (If you'd like to have your company billed instead, call CompuServe at 800-848-8990.) Your personal user ID and a temporary password will be displayed. A new password will arrive in the mail within ten days to confirm your subscription.

ZiffNet membership costs \$2.50 per month. This includes access to *PC Magazine* Editors' Choice awards, Product Reviews Index, Weekly News from *PC Week*, Buyers' Market, ZiffNet Highlights, and the Support Forum (which also includes the current utility). CompuServe members can join by entering `GO PCMAG` at any CompuServe ! prompt.

Outside of these areas, PC MagNet costs \$6.30 per hour for 300-bps service; \$12.80 for 1,200 or 2,400 bps; and \$22.80 for 9,600 bps. Billing is based on 1-minute increments.

These programs can be copied but are copyrighted. You may make copies for others as long as no charge is involved, but making copies for any commercial purpose is strictly prohibited.

What's the
difference between
these two G's?

G G

GOUDY OLD STYLE - \$285

GOUDY OLD STYLE - \$99.95

Plus 123 other typefaces

About 2 C's!



*infini***Type** ^{PLUS}

124
Typefaces

\$99⁹⁵
SUGGESTED
RETAIL PRICE

One of the characters shown above is from a large well-known type vendor. The other is from *infiniType Plus*. If you can't see a difference in quality, don't worry... there isn't one. But if you don't see a difference in value, you should see a financial adviser. *infiniType Plus* contains 124 professional-quality typefaces for under \$100. Provided in both PostScript Type 1 and TrueType formats, these typefaces are compatible with Windows 3.0 and 3.1, OS/2 and any other application that supports PostScript or TrueType.

Plus, there's a DOS type scaling engine that lets you use *infiniType Plus* (or any PostScript Type 1 font) in WordPerfect, LetterPerfect, WP Works, Microsoft Word and Works.

For lighter tastes, there's *infiniType Volume 1*, 50 great faces in PostScript and TrueType format for only \$49.95.

infiniType... take a close look and you'll see.

The only real difference is the price. Call to order or request a type poster and free test drive diskette.*

1-800-346-5764



Antique Olive
BALLOON
Baskerville
Bodoni
Clearface
Commercial Script

SoftMaker

2195 Faraday Avenue Suite A
Carlsbad, California 92008

619-929-6030

CIRCLE 212 ON READER SERVICE CARD

Goudy Old Style
Honeymoon
MicroSquare
Ondine
Quadrat
VAG Rounded

These are just a small sample of
the 124 fonts in *infiniType Plus*

*Test drive is for DOS versions of WordPerfect and Microsoft products only. Typefaces are also available for the Macintosh. *infiniType* is a trademark of SoftMaker, Inc. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation. OS/2 is a trademark of IBM. TrueType is a registered trademark of Apple Computer, Inc. PostScript is a registered trademark of Adobe System, Inc.

The FrameProc Function

```

////////////////////////////////////
// FrameProc() - a good example of how Message Crackers may be used.
// It intercepts messages, handles the ones used by ANIMATOR, and
// sends the rest to DefWndProc().
////////////////////////////////////

LRESULT _export CALLBACK FrameProc (WNDPROC_PARAMS)
{
    switch (uMsg)
    {
        HANDLE_MSG (hwnd, WM_CREATE,           Frame_OnCreate);
        HANDLE_MSG (hwnd, WM_INITMENU,         Frame_OnInitMenu);
        HANDLE_MSG (hwnd, WM_COMMAND,          Frame_OnCommand);
        HANDLE_MSG (hwnd, WM_SIZE,             Frame_OnSize);
        HANDLE_MSG (hwnd, WM_CLOSE,            Frame_OnClose);
        HANDLE_MSG (hwnd, WM_DESTROY,          Frame_OnDestroy);
    }

    return (LRESULT)DefFrameProc(hwnd, _hwndClient, uMsg, wParam, lParam);
}

```

Figure 5: This function illustrates the simplicity of using Message Crackers.

```

lpfn = MakeProcInstance (NotifyProc,
    _hInst);
if (lpfn != NULL)
{
    NotifyRegister (NULL, NF_NORMAL);
}

```

You specify the task handle with which to associate the callback as the first parameter; NULL sets it to the current task. NotifyProc() is the application-supplied callback function that is activated when a task terminates or is created. The third parameter simply specifies that you want to receive normal default notification messages. Figure 3 illustrates what ANIMATOR does in the callback function. Whenever a task is created or destroyed,

a message is posted to ANIMATOR's frame window that indicates whether a task has been created or has terminated.

INSTALLING THE SYSTEM TIMER In order to install a system timer, the SetTimer() function is called. Either the application receives a message in its window procedure or a callback function can be installed. The syntax is as follows:

```

UINT SetTimer(hwnd, idTimer,
    uTimeout, tmprc)

```

The window handle to receive the message is hwnd, and idTimer is an ID value that SetTimer() uses to identify your timer event. SetTimer() also returns this value if the function was successful.

When ICON ANIMATOR is exiting, it calls the KillTimer() function with the window handle of the calling program and the idTimer number. The uTimeout value represents the amount of time, in milliseconds, between timer events. It is here that ICON ANIMATOR passes what I have called the frame rate; that is, the Timer Interval the user specifies by selecting the Animate | Settings command. The tmprc parameter is the procedure-instance address of the callback that will process the timer event. (MakeProcInstance() must be called in order to install the procedure instance). Figure 4 shows the callback that ICON ANIMATOR uses to respond to timer events.

MESSAGE CRACKERS Message Crackers, which replace the enormous switch statement normally found in a window callback function with a set of well-defined functions, are an excellent way to organize and simplify Windows code. Using Message Crackers will also make your applications compatible with the Win32 API. The heart of this new way of programming is in WINDOWSX.H, which contains all definitions needed to implement Message Crackers. Simply

```

#include <windows.h>
...
#include <windowsx.h>
...

```

and you have access to all its facilities.

A very good way to see what WIN-

The Child_OnMeasureItem and Child_OnDrawItem Functions

```

////////////////////////////////////
// Child_OnMeasureItem() - tells Windows how to size the list box.
////////////////////////////////////

LONG NEAR PASCAL Child_OnMeasureItem (
    HWND hwnd, LPMEASUREITEMSTRUCT lpms)
{
    lpms->itemHeight = GetANSITextHeight()+ICON_DY+PADDING;
    return 0L;
}

////////////////////////////////////
// Child_OnDrawItem() - Does the primary drawing for each item in the
// listbox, and calls the HandleFocusState() and HandleSelection()
// functions as necessary.
////////////////////////////////////

LONG NEAR PASCAL Child_OnDrawItem (
    HWND hwnd, const DRAWITEMSTRUCT FAR * lp)
{
    short sChild = WINDOWNUM(hwnd);

    if ((lp->CtlType == ODT_LISTBOX) && (lp->CtlID == IDD_LISTBOX))
    {
        if (NUMICONS(sChild) == 0)
        {

```

```

            return 0L;
        }

        if (lp->itemAction & ODA_DRAWENTIRE)
        {
            DrawIcon (lp->hDC,
                (lp->rcItem.right - lp->rcItem.left - ICON_DX)/2,
                lp->rcItem.top+(PADDING/2),
                HICONS(sChild)(lp->itemID));

            HandleSelectionState(lp);
        }

        // If a list box item was just selected or unselected,
        // call function (which could check if ODS_SELECTED bit is set)
        // and draw item in selected or unselected state.

        if (lp->itemAction & ODA_SELECT)
        {
            HandleSelectionState(lp);
        }

        return 1L;
    }
    return 0L;
}

```

Figure 6: These two functions tell Windows how to draw and size each list box entry.

This is one color printer you can gang up on.

Only one color printer can output anything your department dishes up.

The ColorPoint PSX from Seiko Instruments.

Come on, everybody. Send your 50-page presentations, font-laden color layouts, artistic illustrations, whatever. The ColorPoint PSX cranks them out. With its multi-tasking print server, the PSX can accept files from many sources at the same time, manage a large job queue, and process one job while printing another. All at the same time.

And, thanks to its 25 MHz RISC microprocessor, it prints blazing color at blazing speeds.

The ColorPoint PSX is ideal for network use. This workhorse prints from a full spectrum of computers, including PCs, Macs, and UNIX workstations in any combination on a network.

As you can see, we're pretty confident about the ColorPoint PSX's ability to take on your entire department. But don't take our word on it. Make us prove to you how easy it is to color coordinate your whole gang. Call 1-800-888-0817.

The ColorPoint PSX Multi-User Color Printer.

SII 
Seiko Instruments



The ColorPoint PSX prints images up to 11" x 17" full bleed color. PSX is a trademark of Seiko Instruments USA Inc. PostScript is a trademark of Adobe Systems Inc. © 1993 Seiko Instruments USA Inc. All rights reserved.

DOWSX.H has to offer is to study the file WINDOWSX.TXT in the Windows SDK. There you will find:

- kernel macro APIs to manipulate far pointers;
- GDI macros to manipulate pens, regions, brushes, fonts, and bitmaps;
- user macros to manipulate windows and dialog boxes;
- macros for handling and forwarding all documented Windows messages passed to a window procedure (these are the Message Crackers); and
- macros for sending messages to Windows-supplied controls.

Message Crackers provide a seamless transition to changes in parameter-passing methods to window procedures, separating message-handling code into neat, organized functions.

Figure 5 shows a good example of how Message Crackers are used. Their main purpose is to provide a seamless transition from changes in parameter-passing methods to window procedures. At the same time, however, they separate your message handling code into neat, organized handler functions. The following is an example of the Message Cracker function prototype for the WM_COMMAND message:

```
VOID Cls_OnCommand(HWND hwnd, int
    id, HWND hwndCtl, UINT codeNotify);
```

This function shows the call the handler function makes for WM_COMMAND. Notice the Cls_ at the beginning of the function prototype. The WINDOWSX.TXT included with the Windows SDK file suggests that you replace this with the class name of the window that uses the handler.

The HANDLE_MSG() macro is the universal macro used for all messages in this window procedure. It is defined as:

```
#define HANDLE_MSG(hwnd,
    message, fn) \

    case (message): return
        HANDLE_##message((hwnd),
            (wParam), (lParam), (fn))
```

You may not want to use HANDLE_MSG(), since it automatically returns the outcome of the handler. In that case, the following again uses WM_COMMAND as the example to illustrate what HANDLE_MSG() calls:

```
#define HANDLE_WM_COMMAND
(hwnd, wParam, lParam, fn) \
((fn)((hwnd), (int)(wParam),
    (HWND)LOWORD(lParam),
    (UINT)HIWORD(lParam)), 0L)

#define FORWARD_WM_COMMAND
(hwnd, id, hwndCtl, codeNotify, fn) \
(void)(fn)((hwnd), WM_COMMAND,
    (WPARAM)(int)(id),
    MAKELPARAM((UINT)(hwndCtl),
    (codeNotify)))
```

These macros simply call and forward a WM_COMMAND message to the specified handler function without returning anything. The hardest part of implementing them is converting all of your code over to this style!

THE OWNER-DRAW LIST BOX The owner-draw style of list box provides the programmer with an easy way to create a very user-friendly interface. Applications that contain dialog boxes listing files (such as you find among the Common Dialog Boxes supplied with Windows 3.1) contain little folderlike icons for the directories and drivelike icons next to the drives listed. This is a direct result of owner-list-box programming. The term *owner-draw* means that the owner of the list box is responsible for drawing each item in the list box. Figure 6 shows two Message Crackers that handle the drawing entirely: Child_OnDrawItem() and Child_OnMeasureItem().

When creating the list box, you must specify either LBS_OWNERDRAWFIXED or LBS_OWNERDRAWVARIABLE. If you select LBS_OWNERDRAWFIXED, all list box items will have the same height and Windows will call the Child_OnMeasure-

Item() once. This is how ICON ANIMATOR tells Windows to size the list of icons so that it fits the height of the icon image as well as the height of the text vertically. If I had specified LBS_OWNERDRAWVARIABLE, then Windows would call the Child_OnMeasureItem() separately for each and every list box item.

The Child_OnDrawItem() function is called each time an item gains or loses focus, each time an item is selected or unselected, and each time an item is drawn. Figure 6 demonstrates how ICON ANIMATOR handles each of the cases. Notice the second parameter to Child_OnDrawItem() is a far constant pointer to a DRAWITEMSTRUCT:

```
typedef struct tagDRAWITEMSTRUCT
{
    UINT CtlType;
    UINT CtlID;
    UINT itemID;
    UINT itemAction;
    UINT itemState;
    HWND hwndItem;
    HDC hDC;
    RECT rcItem;
    DWORD itemData;
} DRAWITEMSTRUCT;
```

ICON ANIMATOR is particularly interested in the itemID, hDC, and rcItem members. The itemID member is used to retrieve the handle of the current icon to be drawn. The list box device context is specified by hDC; you do not need to get or release this device context. The rcItem member specifies a rectangle in the device context identified by the hDC member that defines the boundaries of the control to be drawn. For further information on the structure members and other uses and types of owner-draw controls, refer to the *Programmer's Reference* of the Windows SDK.

IN SUMMARY ICON ANIMATOR enables users to do something creative that they couldn't do before, and gives programmers useful Windows programming techniques. It livens up your desktop, making your work more fun. □

PHILIP B. ESKELIN, JR., IS A SOFTWARE ENGINEER AT TURNING POINT SOFTWARE.

★ An Out-Of-This World Price ★ On Microsoft Office! \$335★



★ AND current users ★
 of Microsoft Excel, Word
 or PowerPoint can also
 take advantage of a special
 \$50 manufacturer's
 rebate offer. For a low,
 low, low price of **\$285.**



Get an out-of-this world price on Microsoft Office. For a limited time, you can get the latest version of The Microsoft® Office for Windows™ at the low Software Spectrum price of \$335* when you upgrade from any qualifying spreadsheet, word processor, presentation graphics program, or "suite" of products for MS-DOS® or Windows operating system. The Microsoft Office gives you Microsoft Word, the leading word processor for Windows; Microsoft Excel, the highest-rated spreadsheet for Windows; Microsoft PowerPoint®, the powerful, yet easy presentation graphics program; and a Microsoft Mail Workstation License for the most advanced electronic mail system for Windows. And Software Spectrum gives you the convenience of toll-free shopping. Friendly, knowledgeable salespeople who know more than just prices. Reliable technical support. Plus same-day shipping of orders received before 4:00 pm (Central).

1.800.824.3323
 7 am to 7 pm (Central)

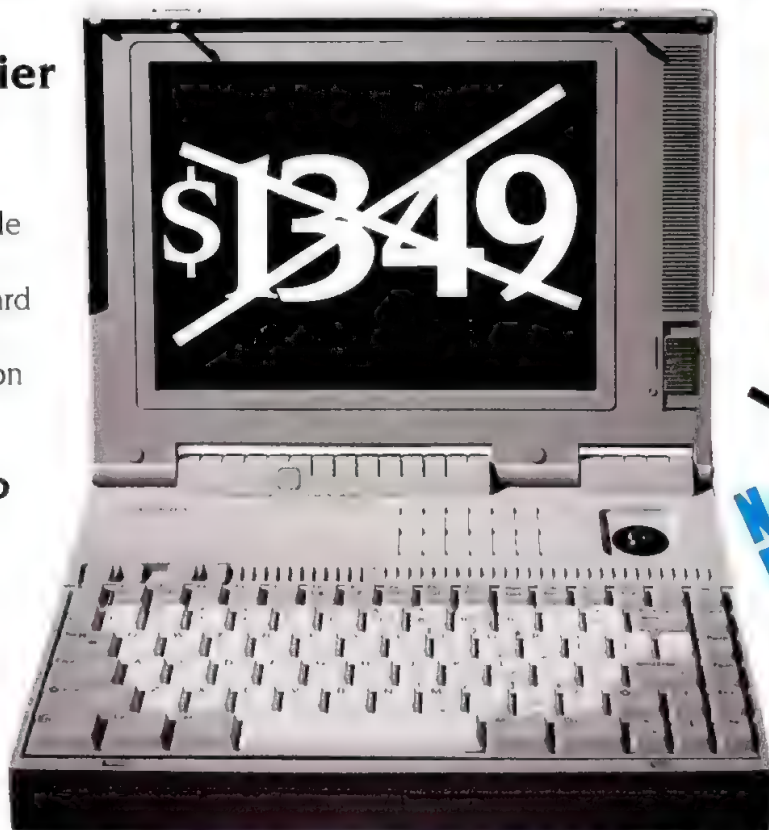
**SOFTWARE
 SPECTRUM**

CIRCLE 282 ON READER SERVICE CARD
 *Upgrade price. Offer Good While Supplies Last. Prices subject to change. Customers must provide proof of purchase. Other restrictions may apply.
 © 1993 Software Spectrum. Microsoft, MS-DOS, and PowerPoint are registered trademarks and Windows is a trademark of Microsoft Corporation.

WHAT DEFICIT?

Hyundai Courier Notebook

- 25MHz 386SXL
- 2MB RAM, Expandable to 8MB
- 80MB **Removable** Hard Drive, 120MB Option
- PCMCIA 2.0 Expansion Slot
- Built-in Trackball
- VGA 640x480 **10" LCD**
- DOS 5.0 and Windows 3.1
- 18-month parts & labor warranty
- Carrying Case
- A/C Adaptor/Charger
- PCMCIA Fax/Modem (Option)



~~New Low Prices Reduced \$200~~
Now Even Lower!

PCMCIA EXPANSION, REMOVABLE 80MB DRIVE, AND TRACKBALL FOR \$1199.



Compared to the Hyundai Courier Notebook, every other product in this price range is suffering from a severe shortage of features. Like PCMCIA expansion capabilities. The Hyundai Courier lets you plug in all those nifty cards to give our notebook more functionality. The other notebooks are deficient here. Our notebook lets you remove the drive so you don't wipe out your data going through airport metal detectors. A serious deficit on other notebooks. And our trackball is built-in. The other guys don't even have one! When it comes to price/performance notebooks, get one that gives you everything you need at a price you want. Call Hyundai today. But hurry, the Courier is so popular, we may soon have a deficit of our own.

Hyundai Spectra Color Notebook

25MHz 486SLC
9" Color LCD VGA 640x480
Built-in Trackball
Math Coprocessor Standard
4MB RAM, Expandable to 16MB
120MB Hard Drive
Built-in FAX & Data Modem
Made in the U.S.A.
12-month on-site service

New Low Price
\$2499

FREE Lotus Organizer

Tech Support 800-289-4986
Tech Fax 800-283-4986
Tech BBS 800-955-5432

HYUNDAI
PCs designed and built in America
800-933-3445

Hours: 6AM-5PM PST M-F
1955 Lundy Avenue
San Jose, CA 95131

PCM 128

We accept MasterCard, Visa, money orders, certified checks (allow 10 days for processing), CODs, approved company and institutional purchase orders, and wire transfers. All return items must be accompanied by a return merchandise authorization (RMA) number. Opened defect-free software is non-refundable. Prices and product descriptions are subject to change without notice. Hyundai is not liable for damage due to omissions or typographical errors. All trademarks are the property of their respective companies. The Do Something logo is a trademark and Do Something New Breed is a registered trademark of Hyundai. © 1993 Hyundai Electronics America. All rights reserved.

CIRCLE 275 ON READER SERVICE CARD

OS/2 Paths and Fonts: The Versatile Connection

BY CHARLES PETZOLD

Every character in an outline font is defined by a series of straight lines and curves. Normally, when a graphics programming system displays text using outline fonts, it fills the areas defined by these lines to render the characters. However, some advanced graphics systems are able to use the character outlines for other purposes; for example, clipping.

This is an area where Microsoft Windows is currently weak. Despite the fact that Windows 3.1 introduced an outline font technology known as TrueType, the Windows Graphics Device Interface (GDI) does not include the necessary support to use TrueType fonts for anything much beyond displaying normal

text. As a compromise, Windows allows a program to access the lines and curves that compose each character in a TrueType font. But in order to get the tools necessary to use TrueType fonts in a truly versatile manner (such as matrix transforms and paths), you will have to wait for Windows NT.

The OS/2 Graphics Programming Interface (GPI), on the other hand, was designed from the ground up to support matrix transforms, paths, and outline fonts. The outline fonts included in OS/2 1.1 were not hinted fonts—which meant that they were quite illegible at small point sizes—but they were well-integrated with the other graphics features of GPI. With the hinted Adobe Type 1 outline fonts supported under OS/2 2.0, we get the best of both worlds.

In the last issue, I warned that using an outline font in a path could sometimes overflow the 64K segment limit for path storage in OS/2 2.0. This is a problem that should be fixed in OS/2 2.1. All the programs in this column work on a standard VGA with a maximized window. If you have a high-resolution display, the path creation functions may fail. If this happens, try reducing the size of the program's window.

Another problem is that some path operations can be quite slow. The only solution for that (other than buying a new machine) is to have a little patience when you're experimenting with the programs shown in this column.

PATHS AND FONTS In the last issue, I also discussed paths as implemented in OS/2. A *path* is a collection of line defini-

OLFLINE.MAK and OLFLINE.C

Complete Listing

A

```

-----
# OLFLINE.MAK Make file
-----

offline.exe : offline.obj olfdemo.obj olf.obj olfdemo.def
             link386 /BASE:0x10000 offline olfdemo olf,, NUL,, olfdemo

offline.obj : offline.c olf.h
             gcc -C -Kbcpr -Ss offline.c

olfdemo.obj : olfdemo.c
             gcc -C -Kbcpr -Ss olfdemo.c

olf.obj : olf.c olf.h
             gcc -C -Kbcpr -Ss olf.c

```

B

```

/*-----
  OLFLINE.C -- Outlined OS/2 Outline Font
              (c) Charles Petzold, 1993
  -----*/

#define INCL_WIN
#define INCL_GPI
#include <os2.h>
#include <string.h>
#include "olf.h"

#define LCID_FONT 1

void PaintClient (HPS hps, SHORT cxClient, SHORT cyClient)
{
    static CHAR szText [] = "Hello!";
    POINTL     ptl, aptlTextBox [TXTBOX_COUNT];

```

```
// Create and size the logical font
```

```
CreateOutlineFont (hps, LCID_FONT, "Times New Roman Italic", 0, 0);
GpiSetCharSet (hps, LCID_FONT);
ScaleOutlineFont (hps, 1440, 1440);
```

```
// Get the text box
```

```
GpiQueryTextBox (hps, strlen (szText), szText,
                TXTBOX_COUNT, aptlTextBox);
```

```
// Create the path
```

```
GpiBeginPath (hps, 1);
```

```
ptl.x = (cxClient - aptlTextBox [TXTBOX_CONCAT].x) / 2;
ptl.y = (cyClient - aptlTextBox [TXTBOX_TOPLEFT].y
        - aptlTextBox [TXTBOX_BOTTOMLEFT].y) / 2;
```

```
GpiCharStringAt (hps, &ptl, strlen (szText), szText);
```

```
GpiEndPath (hps);
```

```
// Outline the path
```

```
GpiSetLineWidth (hps, LINEWIDTH_THICK);
GpiOutlinePath (hps, 1, 0);
```

```
// Select the default font; delete the logical font
```

```
GpiSetCharSet (hps, LCID_DEFAULT);
GpiDeleteSetId (hps, LCID_FONT);
}
```

Figure 1: The Make file and source code for creating OLFLINE.EXE.



NEW! TURBOCAD™

for Windows

The fastest, easiest way to turn your ideas into reality

Just \$149⁹⁵



Introducing NEW TurboCAD™ for Windows...the fastest, friendliest way yet to design and draft with 100% precision. In minutes, you'll be creating home and office layouts... floor plans... landscape designs... electronic diagrams... plumbing diagrams... flow charts... and more.

- ✓ Draw any geometric shape with ease
- ✓ Change settings "on-the-fly"
- ✓ Import and export HPGL and DXF files
- ✓ Create quality drawings with powerful drafting tools like:
 - Automatic double-line drawing
 - Automatic and associative dimensioning
 - Filletting and hatching
 - Spline and Bezier curves
 - Linear, radial or array copying
 - Powerful scripting language

If you can visualize it, and you want it precise, draw it with TurboCAD™.

Order now and get over 500 professionally-drawn symbols FREE!

Call: 7am to 7pm PST
1-800-833-8082

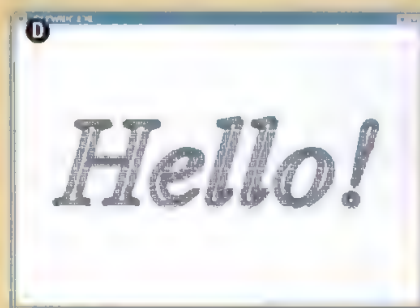
Or, FAX 24-hours a day:
1-415-454-8901

Also available from your favorite dealer.

Insi

1938 Fourth Street
San Rafael, CA 94901
415-454-7101

■ The Results of Using Paths and Fonts



By incrementally enhancing OLF.C, the programs presented here show how to draw an outlined font (A), an outlined font with a drop shadow (B), an outlined font with normal fonts underneath (C), a font both stroked and outlined with a modified path (D), a font with only an outlined modified path (E), a font both filled and outlined (F), and an outlined font drawn with Bezier splines (G).

tions stored internally in GPI. To create a path, you call line-drawing functions within a *path bracket*, which is delimited by calls to the `GpiBeginPath` and `GpiEndPath` functions. A Presentation Manager program can then use the path for outlining, stroking, filling, clipping, or converting to a region.

Outlining and stroking paths are in one way quite similar: In both cases, GPI

draws the path as a series of lines. But there the similarity ends. Creating an outlined path is basically the same as drawing the lines without using a path. The lines can have a style (such as being composed of dots and dashes) and a width. The width is limited to a normal width and a thick (that is, double) width. This is known as the *cosmetic* line width. It is not affected by any transforms that influ-

"Networking Product of the Year"

InfoWorld - Reader's Choice 1992

"Highest Overall Rating"

NSTL/*Software Digest* Ratings Report of Windows-Based
Peer to Peer Networking Products, Feb. 1993

"Technical Excellence Award"

PC Magazine - Networking/Communication Product

"Best Networking Software or Hardware"

PC Computing - MVP Award

"Operating Environment of the Year"

BYTE Magazine - User's Choice Award

"Top 50 Best Buys of 1992"

Corporate Computing

"Best Networking Software Award"

Windows User Magazine

"Winner in Five Categories"

Computerworld - Brand Preference Study for Peer to Peer
Operating Systems

BUT ENOUGH ABOUT US. LET'S TALK ABOUT YOU.

We're pleased that Microsoft® Windows™ for Workgroups has been getting praise from the experts.

But exactly what can it do for you? The best answer comes from the people who use it every day. Our customers have found that it's the easiest way to add printer and file sharing to the Microsoft Windows operating system.

In other words, it helps all the people they work with, work together. Talk about productive.



Microsoft
Making it easier

© 1993 Microsoft Corporation. All rights reserved. Printed in the USA. In the 50 United States, call (800) 426-9400; customers in Canada, call (800) 563-9048; and outside the 50 United States and Canada, call your local Microsoft subsidiary or call (206) 936-8661. Microsoft is a registered trademark and Windows and the Windows logo are trademarks of Microsoft Corporation.

OLFDROP.MAK and OLFDROP.C

Complete Listing

A

```

#-----
# OLFDROP.MAK Make file
#-----

olfdrop.exe : olfdrop.obj olfdemo.obj olf.obj olfdemo.def
link386 /BASE:0x10000 olfdrop olfdemo olf,, NUL,, olfdemo

olfdrop.obj : olfdrop.c olf.h
icc -C -Kbcpr -Ss olfdrop.c

olfdemo.obj : olfdemo.c
icc -C -Kbcpr -Ss olfdemo.c

olf.obj : olf.c olf.h
icc -C -Kbcpr -Ss olf.c

```

B

```

/*-----
OLFDROP.C -- Drop Shadow OS/2 Outline Font
(c) Charles Petzold, 1993
-----*/

#define INCL_WIN
#define INCL_GPI
#include <os2.h>
#include <string.h>
#include "olf.h"

#define LCID_FONT 1

void PaintClient (HPS hps, SHORT cxClient, SHORT cyClient)
{
    static CHAR szText [] = "Hello!";
    POINTL ptl, aptlTextBox [TXTBOX_COUNT];

    // Create and size the logical font

```

```

CreateOutlineFont (hps, LCID_FONT, "Times New Roman Italic", 0, 0);
GpiSetCharSet (hps, LCID_FONT);
ScaleOutlineFont (hps, 1440, 1440);

// Get the text box

GpiQueryTextBox (hps, strlen (szText), szText,
    TXTBOX_COUNT, aptlTextBox);

// Display the font normally twice

ptl.x = (cxClient - aptlTextBox [TXTBOX_CONCAT].x) / 2;
ptl.y = (cyClient - aptlTextBox [TXTBOX_TOPLEFT].y
    - aptlTextBox [TXTBOX_BOTTOMLEFT].y) / 2;

GpiCharStringAt (hps, &ptl, strlen (szText), szText);

ptl.x -= 10;
ptl.y += 10;

GpiSetColor (hps, CLR_BACKGROUND);
GpiCharStringAt (hps, &ptl, strlen (szText), szText);

// Create the path

GpiBeginPath (hps, 1);
GpiCharStringAt (hps, &ptl, strlen (szText), szText);
GpiEndPath (hps);

// Outline the path

GpiSetColor (hps, CLR_NEUTRAL);
GpiSetLineWidth (hps, LINEWIDTH_THICK);
GpiOutlinePath (hps, 1, 0);

// Select the default font; delete the logical font

GpiSetCharSet (hps, LCID_DEFAULT);
GpiDeleteSetId (hps, LCID_FONT);
}

```



Figure 2: The Make file and C source code for creating OLFDROP.EXE. OLFDROP.C uses a path to draw a drop-shadowed font.

OLFBLOK.MAK and OLFBLOK.C

Complete Listing

A

```

#-----
# OLFBLOK.MAK Make file
#-----

olfblok.exe : olfblok.obj olfdemo.obj olf.obj olfdemo.def
link386 /BASE:0x10000 olfblok olfdemo olf,, NUL,, olfdemo

olfblok.obj : olfblok.c olf.h
icc -C -Kbcpr -Ss olfblok.c

olfdemo.obj : olfdemo.c
icc -C -Kbcpr -Ss olfdemo.c

olf.obj : olf.c olf.h
icc -C -Kbcpr -Ss olf.c

```

B

```

/*-----
OLFBLOK.C -- Blocked OS/2 Outline Font
(c) Charles Petzold, 1993
-----*/

#define INCL_WIN
#define INCL_GPI
#include <os2.h>
#include <string.h>
#include "olf.h"

#define LCID_FONT 1

void PaintClient (HPS hps, SHORT cxClient, SHORT cyClient)
{
    static CHAR szText [] = "Hello!";
    int i;
    POINTL ptl, aptlTextBox [TXTBOX_COUNT];

    // Create and size the logical font

    CreateOutlineFont (hps, LCID_FONT, "Times New Roman Italic", 0, 0);
    GpiSetCharSet (hps, LCID_FONT);

```

```

ScaleOutlineFont (hps, 1440, 1440);

// Get the text box

GpiQueryTextBox (hps, strlen (szText), szText,
    TXTBOX_COUNT, aptlTextBox);

// Display the font normally

ptl.x = (cxClient - aptlTextBox [TXTBOX_CONCAT].x) / 2;
ptl.y = (cyClient - aptlTextBox [TXTBOX_TOPLEFT].y
    - aptlTextBox [TXTBOX_BOTTOMLEFT].y) / 2;

for (i = 0; i < 16; i++)
{
    GpiCharStringAt (hps, &ptl, strlen (szText), szText);

    ptl.x --;
    ptl.y ++;
}

GpiSetColor (hps, CLR_BACKGROUND);
GpiCharStringAt (hps, &ptl, strlen (szText), szText);

// Create the path

GpiBeginPath (hps, 1);
GpiCharStringAt (hps, &ptl, strlen (szText), szText);
GpiEndPath (hps);

// Outline the path

GpiSetColor (hps, CLR_NEUTRAL);
GpiSetLineWidth (hps, LINEWIDTH_THICK);
GpiOutlinePath (hps, 1, 0);

// Select the default font; delete the logical font

GpiSetCharSet (hps, LCID_DEFAULT);
GpiDeleteSetId (hps, LCID_FONT);
}

```



Figure 3: The Make file and C source code for creating OLFBLOK.EXE. OLFBLOK.C uses a path to draw a blocked font.



SUPERIOR DISPLAYS ARE PART OF OUR HERITAGE.

PC
MAGAZINE
EDITORS'
CHOICE

June 30, 1992
FlexScan F550t

PC
MAGAZINE
EDITORS'
CHOICE

March 1993
Nanao FlexScan F340W

Three hundred years ago, our ancestors in the Nanao area of Japan created Kutani, one of the classic styles of Japanese porcelain that is meticulously crafted for display. Inspired by their vision to create such colorful, intricate art, we recreate the richest, deepest colors in our innovative computer displays: the distinguished Nanao FlexScan® monitor family.

Inherited with a discerning eye and practiced touch, we finely tune every monitor, bringing you displays with a brilliant palette and clear, sharp images – retaining a tradition that reflects our vibrant history and parallels the technology of today.

From the affordable 15" to the 21" big-screen, our FlexScan family features top-of-the line flat-square CRTs with ergonomic enhancements including easy-to-use microprocessor-based controls, flicker-free refresh rates and a healthy work environment that meets the Swedish MPR II and TCO low emission standards. We've also added ecological features such as an energy-saving auto-power ON/OFF switch. And all of our monitors optimize performance for Windows users or CAD/CAM, DTP professionals.

From generations of finely-crafted displays, our renowned monitor family continues a heritage that is uniquely Nanao.

MVP
WINNER



FlexScan T660t

BEST OF
EVTE
COMDEX/FALL 92

Finalist
FlexScan F340W

NANAO®

Superior in every detail.

NANAO U.S.A. CORPORATION
CIRCLE 283 ON READER SERVICE CARD

23535 Telo Avenue, Torrance, CA 90505
(310) 325-5202

1-800-800-5202

OLFWIDE.MAK and OLFWIDE.C

Complete Listing

A

```

-----
# OLFWIDE.MAK Make file
-----

olfwide.exe : olfwide.obj olfdemo.obj olf.obj olfdemo.def
             link386 /BASE:0x10000 olfwide olfdemo olf,, NUL,, olfdemo

olfwide.obj : olfwide.c olf.h
             gcc -C -Kbcpr -Ss olfwide.c

olfdemo.obj : olfdemo.c
             gcc -C -Kbcpr -Ss olfdemo.c

olf.obj : olf.c olf.h
          gcc -C -Kbcpr -Ss olf.c

```

B

```

/*-----
   OLFWIDE.C -- Wide-Lined OS/2 Outline Font
               (c) Charles Petzold, 1993
   -----*/

#define INCL_WIN
#define INCL_GPI
#include <os2.h>
#include <string.h>
#include "olf.h"

#define LCID_FONT 1

void PaintClient (HPS hps, SHORT cxClient, SHORT cyClient)
{
    static CHAR szText [] = "Hello!";
    POINTL      ptl, aptl, tptl [TXTBOX_COUNT];

    // Create and size the logical font

    CreateOutlineFont (hps, LCID_FONT, "Times New Roman Italic", 0, 0);
    GpiSetCharSet (hps, LCID_FONT);

```

```

    ScaleOutlineFont (hps, 1440, 1440);

    // Get the text box

    GpiQueryTextBox (hps, strlen (szText), szText,
                    TXTBOX_COUNT, aptl, tptl);

    // Create the path

    GpiBeginPath (hps, 1);

    ptl.x = (cxClient - aptl[0].x) / 2;
    ptl.y = (cyClient - aptl[0].y) / 2;

    GpiCharStringAt (hps, tptl, strlen (szText), szText);

    GpiEndPath (hps);

    // Stroke the path

    GpiSetLineWidthGeom (hps, 10);
    GpiSetPattern (hps, PATSYM_HATCH);
    GpiStrokePath (hps, 1, 0);

    // Create the path again

    GpiBeginPath (hps, 1);
    GpiCharStringAt (hps, tptl, strlen (szText), szText);
    GpiEndPath (hps);

    // Modify and outline the path

    GpiModifyPath (hps, 1, MPATH_STROKE);
    GpiOutlinePath (hps, 1, 0);

    // Select the default font; delete the logical font

    GpiSetCharSet (hps, LCID_DEFAULT);
    GpiDeleteSetId (hps, LCID_FONT);
}

```



Figure 4: The Make file and source code for creating OLFWIDE.EXE. OLFWIDE.C uses a path to draw a font with geometrically thick outlines.

ence the size of other graphical objects.

GPI draws a stroked path using a line with a *geometric* width. The geometric width can be as large as you want it to be, and it is affected by transforms. GPI fills cosmetic lines with the current area-filling pattern, and also allows you to specify different line ends and joins. Drawing geometric lines without using paths is not possible.

The connection between paths and outline fonts is very simple: When an outline font has been selected into a presentation space, you can call text output functions within the path bracket. The character outlines become part of the path.

OUTLINED CHARACTERS Let's try it. The OLFLINE program shown in Figures 1(a) and 1(b) uses a path and the GpiOutlinePath function to draw outlined characters.

This program requires the OLF (outline font) files from the April 13, 1993, issue and the OLFDemo files from the April 27, 1993, issue. These files provide simplified outline font selections and the

normal Presentation Manager overhead necessary for demonstrating simple graphics. You will also need IBM's C Developer's WorkSet/2 installed to run NMAKE on the Make file and create OLFLINE.EXE. Or, you can download all the files and executables for this program and all others mentioned in this column from the Programming forum on PC MagNet, where they are archived as OLFONT.ZIP.

The program begins by using the CreateOutlineFont and ScaleOutlineFont functions in OLF.C to create a Times New Roman Italic font and scale it to a 144 point size. It then uses GpiQueryTextBox to obtain the text box dimensions of the string "Hello!" This information is used to center the text string in the client window. The program begins the path bracket by calling GpiBeginPath, draws the character string by calling GpiCharStringAt, and ends the path bracket with GpiEndPath.

At this point, nothing has yet been drawn on the client window. OLFLINE.C calls GpiSetLineWidth to select

a thick line and then GpiOutlinePath to render the path on the window, as shown in Figure A in the "The Results of Using Paths and Fonts" sidebar. Of course, you can get the same effect without a path by using the FATTR_SEL_OUTLINE attribute when creating the font. However, if you want to use the normal filled font together with the outlined font, you will have to create two fonts. Using the path, you need only one.

A DROP-SHADOW FONT When drawing a text string with a drop shadow, for example, you need both a normal font and an outline font. In the May 11, 1993, issue I drew a font shadow using an abnormally tall font tilted to one side using the GpiSetCharShear function, creating the effect of a font standing perpendicular to the surface on which its shadow appears.

A drop shadow, on the other hand, makes the object appear as if it's suspended in front of the screen. By convention, such shadows are drawn as if the light source originates from the upper left corner of the video display.

The OLFDROP program shown in

The **NEW** under \$1000 TI microWriter PS23
is the best value in laser-quality PostScript printers.

23 Scalable PostScript typeface
fonts in popular Adobe® PostScript® formats.

Crisp, *#Δ sharp graphics.

LED technology uses fewer **MOVing PArts**
than conventional laser printers for great reliability.

Automatically switches between **PostScript**
and **HP LASERJET™ II** printing formats.

☛ Easy to use front control panel.

"**Plug and Play**" convenience in both
Mac® (Apple®) and Windows® (IBM®) environments.

With available options, can handle up to **3** trays
of paper, including envelopes and labels.



**YOU COULD
SPEND A LOT MORE
AND HAVE A LOT LESS
TO SHOW FOR IT.**

For years, capability and affordability were mutually exclusive features of laser-quality printers. But

the new microWriter™ PS23 from Texas Instruments has changed all that. Now you can get sharp, crisp laser-quality images, rapid 5 page-per-minute operation and the reliability of LED technology. All in one

very affordable printer. Thus enabling you to print more. Produce more. Do more. In other words, to

extend your reach. The new TI microWriter PS23. It can make a small business look a lot bigger. And a big business look a lot smarter. For more information and your nearest dealer, please call 1-800-527-3500.

**EXTENDING YOUR REACH
WITH INNOVATION™**

 **TEXAS
INSTRUMENTS**

Adobe PostScript and the PostScript logo are registered trademarks of Adobe Systems, Inc. Apple and Mac are registered trademarks of Apple Computer, Inc. IBM is a registered trademark of International Business Machines Corp. Windows is a registered trademark of Microsoft Corp. LaserJet is a registered trademark of Hewlett-Packard, Inc. "Extending Your Reach With Innovation" and microWriter are trademarks of Texas Instruments. © 1993 TI

CIRCLE 139 ON READER SERVICE CARD



Figures 2(a) and 2(b) shows how to draw an outlined font with a drop shadow.

As in OLFLINE, the program creates a 144-point Times New Roman Italic font. The program then draws normal text centered in the client window. This is the shadow. The program switches to the background color by calling `GpiSetColor` with the `CLR_BACKGROUND` parameter. (By default, the background color is white, but it can be changed by the user.) The text is drawn again, offset 10 pixels from the left and bottom of the first text string. (This offset looks fine on a VGA, but in a real program you'll probably want to calculate the offset in a more device-independent manner.) This is the interior of the outlined font.

The program then creates a path containing the font outline, switches back to the foreground color using `GpiSetColor` with the `CLR_NEUTRAL` parameter (which indicates black by default), and calls `GpiOutlinePath`. The results are shown in Figure B of the sidebar.

Another approach to drawing a font with a three-dimensional appearance is shown in the OLFBLK program in Fig-

ures 3(a) and 3(b). This program is very similar to OLFDROP, but instead of drawing just one normal black font, it draws 16 of them, each progressively offset by 1 pixel to the left and 1 pixel up. This is capped by a normal white font, and then an outlined black font. The result is shown in Figure C of "The Results of Using Paths and Fonts" sidebar. The characters appear as if they are carved blocks.

STROKING THE FONT So far, we've been looking at the effects possible with outlining a path by calling `GpiOutlinePath`. You can also render the path by calling `GpiStrokePath`, which draws the path as a geometric thick line filled with the current area-filling pattern.

The OLFWIDE program in Figures 4(a) and 4(b) demonstrates this. As the previous programs do, it creates a 144-point Times New Roman Italic font and draws the "Hello!" text string within a path bracket. OLFWIDE then calls `GpiSetLineWidthGeom` to set the geometric line width at 10 pixels. (In a real program, you'd want to use a more device-independent approach to setting that width.)

The program then sets the area-filling pattern to `PATSYM_HATCH`—a pattern that is a series of horizontal and vertical lines—and calls `GpiStrokePath`. This renders the font outlines as a series of 10-pixel-wide lines filled with the `PATSYM_HATCH` pattern.

The OLFWIDE program then creates another path with the same text string and calls `GpiModifyPath`, which takes an existing path and replaces it with a new path that represents the outline of the geometrically thick line that would be rendered by calling `GpiStrokePath`. Thus, this modified path outlines the area pattern just drawn. The program finishes up by calling `GpiOutlinePath` to outline that pattern. The results are shown in Figure D of the sidebar.

To see the separate effects of stroking and outlining the modified path, you may want to comment out either the `GpiStrokePath` or `GpiOutlinePath` calls in OLFWIDE.C and recompile the program. In particular, if you remove the call to `GpiStrokePath`, you'll see the rather strange-looking display that is shown in Figure E of the sidebar.

OLFFILL.MAK and OLFFILL.C

Complete Listing

A

```

#-----
# OLFFILL.MAK Make file
#-----

olffill.exe : olffill.obj olfdemo.obj olf.obj olfdemo.def
             link386 /BASE:0x10000 olffill olfdemo olf, NUL,, olfdemo

olffill.obj : olffill.c olf.h
             gcc -C -Kbcp -Ss olffill.c

olfdemo.obj : olfdemo.c
             gcc -C -Kbcp -Ss olfdemo.c

olf.obj : olf.c olf.h
             gcc -C -Kbcp -Ss olf.c

```

B

```

/*-----
  OLFFILL.C -- Filled OS/2 Outline Font
              (c) Charles Petzold, 1993
  -----*/

#define INCL_WIN
#define INCL_GPI
#include <os2.h>
#include <string.h>
#include "olf.h"

#define LCID_FONT 1

void PaintClient (HPS hps, SHORT cxClient, SHORT cyClient)
{
    static CHAR szText [] = "Hello!";
    POINTL      ptl, aptl, bptl [TXTBOX_COUNT];

    // Create and size the logical font

    CreateOutlineFont (hps, LCID_FONT, "Times New Roman Italic", 0, 0);

```

```

    GpiSetCharSet (hps, LCID_FONT);
    ScaleOutlineFont (hps, 1440, 1440);

    // Get the text box

    GpiQueryTextBox (hps, strlen (szText), szText,
                    TXTBOX_COUNT, aptl, bptl);

    // Create the path

    GpiBeginPath (hps, 1);

    ptl.x = (cxClient - aptl [TXTBOX_CONCAT].x) / 2;
    ptl.y = (cyClient - aptl [TXTBOX_TOPLEFT].y
            - bptl [TXTBOX_BOTTOMLEFT].y) / 2;

    GpiCharStringAt (hps, &ptl, strlen (szText), szText);

    GpiEndPath (hps);

    // Fill the path

    GpiSetPattern (hps, PATSYM_HATCH);
    GpiFillPath (hps, 1, 0);

    // Create the path again

    GpiBeginPath (hps, 1);
    GpiCharStringAt (hps, &ptl, strlen (szText), szText);
    GpiEndPath (hps);

    // Outline the path

    GpiOutlinePath (hps, 1, 0);

    // Select the default font; delete the logical font

    GpiSetCharSet (hps, LCID_DEFAULT);
    GpiDeleteSetId (hps, LCID_FONT);
}

```

Figure 5: The Make file and source code for creating OLFFILL.EXE. OLFFILL.C uses a path to draw a filled and outlined font.

It drives the PCs that drive the Indy 500.

When you oversee the most technologically advanced race in the world, the engine is running long before the race starts. Massive amounts of data need to be collected. Everything from entry fees, qualifying times and



speeds to engine serial numbers and driver and crew information. Then all the data collected dur-

ing the race needs to be compiled so the results can be validated.

At the world's most famous motor speedway, mission critical is a way of life. That's why the United States Auto Club (USAC®) and the Indy 500® have a computer system with the horsepower to get the job done. And OS/2® is the driving force behind it.

With true pre-emptive multitasking and multithreading capabilities, OS/2 helps USAC process Indy 500 data at record speeds. In fact at this year's Indy, USAC is testing an OS/2-based system that tracks cars via radio signal. In 1994, OS/2 will drive the



official timing and scoring system, and determine the actual winner of the race.

Whether you measure speed in MPH or MHz, OS/2 brings the same high performance to all your DOS, Windows™ and OS/2 applications. And our soon-to-be-released Version 2.1 will be even more powerful. To find out how OS/2 can help your 386 and 486 machines run on all cylinders, call 1 800 IBM-3-OS2*.

Operate at a higher level.

*In Canada call 1-800-465-7999.

IBM and OS/2 are registered trademarks of International Business Machines Corporation. Indy 500 is a registered trademark of IMS Corp. Windows is a trademark of Microsoft Corporation. USAC is a registered trademark of the United States Auto Club. © 1993 IBM Corp.

IBM®

OLFCLIP.MAK and OLFCLIP.C

Complete Listing

```

A
-----
OLFCLIP.MAK Make file
-----

olfclip.exe : olfclip.obj olfdemo.obj olf.obj olfdemo.def
link386 /BASE:0x10000 olfclip olfdemo olf,., NUL.. olfdemo

olfclip.obj : olfclip.c olf.h
icc -C -Kbcpr -Ss olfclip.c

olfdemo.obj : olfdemo.c
icc -C -Kbcpr -Ss olfdemo.c

olf.obj : olf.c olf.h
icc -C -Kbcpr -Ss olf.c

```

```

B
-----
OLFCLIP.C -- OS/2 Outline Font Clipping
(c) Charles Petzold, 1993
-----

#define INCL_WIN
#define INCL_GPI
#include <os2.h>
#include <string.h>
#include "olf.h"

#define LCID_FONT 1

void PaintClient (HPS hps, SHORT cxClient, SHORT cyClient)
{
    static CHAR szText [] = "Hello!";
    int i;
    POINTL ptl, aptl[3], aptlTextBox [TXTBOX_COUNT];

    // Create and size the logical font

    CreateOutlineFont (
        hps, LCID_FONT, "Times New Roman Italic", 0, 0);
    GpiSetCharSet (hps, LCID_FONT);
    ScaleOutlineFont (hps, 1440, 1440);

    // Get the text box

```

```

GpiQueryTextBox (hps, strlen (szText), szText,
    TXTBOX_COUNT, aptlTextBox);

    // Create the path

    GpiBeginPath (hps, 1);

    ptl.x = (cxClient - aptlTextBox [TXTBOX_CONCAT].x) / 2;
    ptl.y = (cyClient - aptlTextBox [TXTBOX_TOPLEFT].y
        - aptlTextBox [TXTBOX_BOTTOMLEFT].y) / 2;

    GpiCharStringAt (hps, &ptl, strlen (szText), szText);

    GpiEndPath (hps);

    // Set the clipping path

    GpiSetClipPath (hps, 1, SCP_AND | SCP_ALTERNATE);

    // Draw Bezier splines

    for (i = 0; i < cyClient; i++)
    {
        GpiSetColor (hps, (i / 16) % 6 + 1);

        ptl.x = 0;
        ptl.y = i;
        GpiMove (hps, &ptl);

        aptl[0].x = cxClient / 3;
        aptl[0].y = i + cyClient / 3;

        aptl[1].x = 2 * cxClient / 3;
        aptl[1].y = i - cyClient / 3;

        aptl[2].x = cxClient;
        aptl[2].y = i;

        GpiPolyspline (hps, 3, aptl);
    }

    // Select the default font; delete the logical font

    GpiSetCharSet (hps, LCID_DEFAULT);
    GpiDeleteSetId (hps, LCID_FONT);
}

```



Figure 6: The Make file and source code to create OLFCLIP.EXE. OLFCLIP.C uses a path for clipping Bezier spline curves.

We saw some of this oddness in the PATHS program in the last issue: When two lines in the path are joined at an angle, the modified path often has a little interior loop. You'll also notice little lines in the interior of the path where the path curves. These are results of GPI's area-filling algorithm, and I'm afraid you'll see similar weirdness in the path implementation in Windows NT.

FILLING THE PATH The third function that uses a path is called `GpiFillPath`, and as the name implies, it fills the interior of the path using the current area-filling pattern. This is different from `GpiStrokePath`, which strokes the path using the area-filling pattern.

However, the `GpiFillPath` and `GpiStrokePath` functions are related: `GpiStrokePath` is equivalent to `GpiModifyPath` followed by `GpiFillPath`. IBM's *Presentation Manager Programming Reference* indicates that `GpiStrokePath` "is provided to enable device drivers to opti-

mize storage, if possible." What happens is that `GpiModifyPath` greatly increases the storage necessary to store the path. A device driver might be able to implement `GpiStrokePath` without requiring that additional storage.

Anyway, let's look at a sample program called `OLFFILL`, shown in (Figures 5(a) and 5(b)). The program is similar to `OLFWIDE`, but less complex. The program creates the path twice. With the first path, `OLFFILL` sets the area-filling pattern to `PATSYM_HATCH` and calls `GpiFillPath`. After creating the second path, the program calls `GpiOutlinePath`. The results (obviously more normal-looking than the `OLFWIDE` display) are shown in Figure F in "The Results of Using Paths and Fonts" sidebar.

PATHS AND CLIPPING When I first began learning graphics programming, the whole concept of clipping really mystified me. Most graphics programming environments support some type of clipping,

but I couldn't understand why it was considered so important in the total feature list of a graphics programming system.

Clipping is basically instructing the graphics programming environment to restrict drawing to a particular area of the display (either the video screen or the printer page). When you set a clipping area, you are actually telling the graphics system not to draw outside of that specified area. Any graphics object you subsequently draw appears only within the area you have set.

What mystified me about clipping is this: If you don't want to draw outside of a particular area, why not just avoid doing so?

Well, as every graphics programmer eventually learns, clipping is not usually necessary, but it is often very convenient. Clipping makes certain tasks much easier than they would be otherwise. For example, GPI prohibits you from drawing outside the window with which the presen-

tation space is associated. This is very convenient because you don't have to worry about drawing on another program's window.

Just as GPI supports several levels of coordinate transforms, GPI also supports several levels of clipping. However, by far the most versatile clipping involves paths. After you create a path, you can use the path as a clipping area simply by calling the following:

```
GpiSetClipPath (hps, lPath,
  lOption) ;
```

To set the clipping path, the lPath parameter must be equal to 1, as is normal with the path functions. The lOption parameter can be a combination of identifiers defined in PMGPI.H beginning with the prefix SCP. These identifiers are defined like so:

```
#define SCP_ALTERNATE 0L
#define SCP_WINDING 2L
#define SCP_AND 4L
#define SCP_RESET 0L
#define SCP_EXCL 0L
#define SCP_INCL 8L
```

Unfortunately, only the first two constants are documented in IBM's programming references. These determine how interiors of intersecting paths are handled, as I discussed in the last installment of this column. However, you also need to include SCP_AND when setting the clipping path. This causes the area defined by the path to be intersected by the current clipping path. To reset the presentation space to prohibit clipping, use a 0 value for the lPath parameter and an SCP_RESET value (also equal to 0) for the lOption parameter. Unfortunately, I have not been able to determine exactly what it is that SCP_EXCL and SCP_INCL are supposed to do.

The OLFCLIP program in Figures 6(a) and 6(b) shows an example of using an outline font for clipping. The program uses the same path we've been using, but after calling the GpiSetClipPath function, it draws a series of colored Bezier splines. The results are shown in Figure G of the sidebar.

POSSIBLE OTHERWISE? Earlier in this discussion, I mentioned that clipping is

not often absolutely necessary when you're working with graphics: I originally wanted to substantiate that statement by showing how to create a display identical to OLFCLIP without using paths or clipping.

The approach I took was this: The program begins by drawing the Bezier splines throughout the client window. Then, after selecting the outline font in the presentation space and determining the dimensions of the text box, the program sets the color to CLR_BACKGROUND and uses GpiBox to effectively erase the Bezier splines at the top, bottom, left, and right of the text box. So far, so good.

Then, the program sets the mix mode by calling GpiSetMix with the FM_LEAVE_ALONE parameter and the background mix mode by calling GpiSetBackMix with the BM_OVERPAINT parameter, and finally calls GpiCharStringAt. When I wrote this program, I was hoping that the area nor-

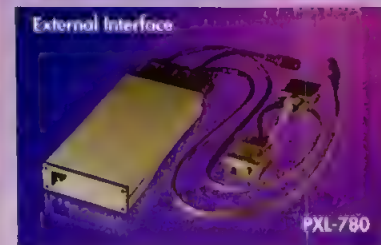
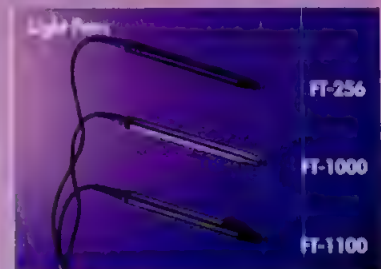
*As every graphics
programmer eventually
learns, clipping is
not usually necessary,
but it's often very
convenient.*

mally occupied by the font characters would be left alone, but the background of the characters (that is, the rectangular text box of each character) would be erased. This would have created a display identical to that shown in Figure G.

Well, I succeeded and I failed. What actually happens when you call GpiCharStringAt with the background mix set to BM_OVERPAINT is that GPI erases the entire character box, not just the area not occupied by the character. So, I was left with nothing. At any rate, even if it were possible to duplicate Figure G, the code would be more complex than the OLFCLIP program. That is certainly an advantage of paths and clipping. □

Add A Pen To Your Desktop PC

Take today's desktop PC, add an updated piece of proven technology, and you're ready for tomorrow's pen computing applications. Today you can draw, point, click, drag and position. Tomorrow you'll use ink for freehand document annotation, gesture editing and handwriting recognition. A light pen does it all with the CRT you've already got on your desk.



With FTG's new external interface, installation and use of a light pen has never been easier. Supporting both Microsoft Windows® for Pen and PenRight!, FTG's Pen Computing packages start at \$398. Call for more information or FTG's 30-day no-risk trial offer.

See Us at Windows World Booth #W8376

**FTG DATA
SYSTEMS**

8381 Katella Avenue, Stanton, CA 90680

(714) 995-3900 (800) 962-3900

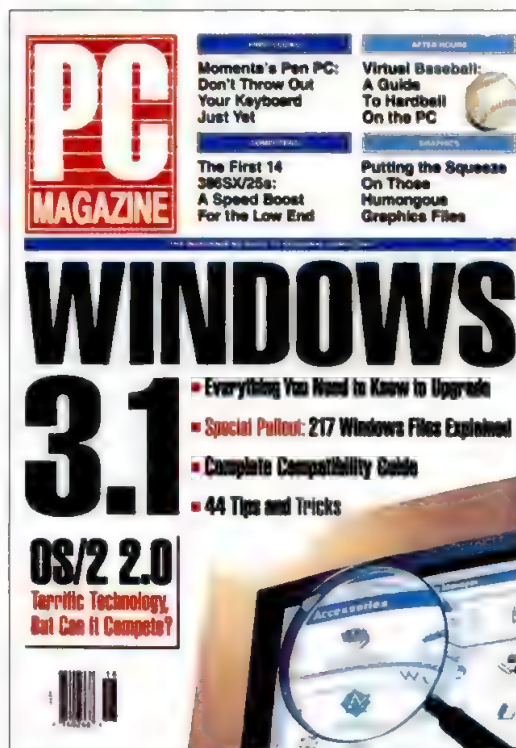
CIRCLE 200 ON READER SERVICE CARD

THINK OF IT AS SOFTWARE FOR YOUR BRAIN.

PC Magazine gets you up and running when it comes to taking command of your PC environment.

Every issue provides in-depth reviews...comprehensive evaluations...news about emerging trends and new technologies...buying tips...and a whole lot more.

And there's a new release 22 times a year to give you the most reliable, most complete, most up-to-date facts on computers and computing.



**SAVE UP TO 62% AND
GET FREE SOFTWARE!**

Sign up for one year, save 54% off the newsstand price, and get 22 issues for just \$29.97. Or, subscribe for two years, save 62%, and get 44 issues for just \$49.97.

Plus, your paid subscription gets you *PC Magazine's* "Utilities Disk Library" on 3 disks — yours **FREE!** This hands-on PC tool contains 104 ultra-powerful utilities to make your system work better and faster.

**Subscribe now to get your free software bonus.
In the U.S. call 1-800-289-0429**

Outside the U.S. write to PC Magazine International
P.O. Box 115 • GPO • Limerick, Ireland

Please add \$32.00 per year for postage outside the U.S.

Four Techniques to Enhance Your Windows Help Files

BY RAY DUNCAN

In the last three columns, we've looked at the process of designing and implementing a simple Windows help file, using the EXE-LOOK utility from three earlier Power Programming columns as an example (the February 9, March 16, and March 30, 1993, issues). In this installment, we'll cover a few more specialized techniques that you can use to enhance your help files.

PERVASIVE HYPERLINKS As you'll remember from our earliest discussions of help file construction, the source files that are fed to the help file compiler are based on three fundamental types of objects: topics, context strings, and hyperlinks.

A help file topic is basically a chunk of information on a single subject. In a help source file, a topic is delimited by *hard page breaks* before and after. From the user's point of view, a topic is a unit of text that appears within a resizable window. The margins of the topic text are automatically adjusted, and the paragraphs of the text are reflowed to fit within the horizontal width of the window. If the reflowed text is too long to fit in the window, the help file viewer adds a scroll bar to the window and lets the user move backward and forward through the text of the topic at will.

A context string is, in programming terms, simply a label that is associated with a location in the help file source. A context string is associated with a topic by creating a footnote at the beginning of the topic, using the number sign (#) as the footnote indicator. The contents of the footnote are the context string or label that symbolically identifies the topic to the help file compiler.

A hyperlink is a *hot spot* in topic text as viewed by the user. When the mouse

cursor is situated directly over a hot spot, it changes to a hand symbol, and when the user clicks the mouse on the hot spot, the help file viewer jumps to another spot in the same (or another) help file. Hot spots can be implemented with either text or graphics, but text hot spots are the most common. From the help file author's perspective, text hot spots are created by double-underlining the text that will be clicked by the user, and by inserting the context string for the topic that is the destination of the hyperlink jump

*With the basics under
our belts, now let's
see how to spiff up
our Windows help files
with hyperlinks, pop-up
and secondary windows,
and bitmaps.*

as hidden text immediately after the underlined text. The hot spot text for ordinary hyperlinks is typically displayed to the user by the help file viewer in green with a solid single underline, although both of these properties can be overridden by the help file author.

In the first of my columns on help files, I showed you how to build a simple hierarchical help file structure where the topic that was first displayed to the user was formatted as a table of contents. The top-level table of contents then led, via hyperlinks, to other topics which were formatted as subsidiary or more detailed tables of contents, and those in turn brought the user via additional hyper-

links to the topics that contained the actual help text the user was looking for. Most help files, however, are only organized as such simple hierarchies in the earliest stages. As the help file evolves, additional words in the body of each topic are marked as hyperlinks to let the user jump back and forth through the help file to closely related topics, to display definitions, or to move quickly from more abstract discussions to more detailed explanations and vice versa. The final result is more like a dense mesh of hyperlinks than a tree structure.

Pervasive hyperlinks in the help file may be extremely helpful to the help file's user, but they represent an immense amount of manual labor for the help file author. Microsoft does not supply an integrated development environment for help source files that is savvy about hyperlinks—after all, the help source files are merely created in a word processor that knows how to format footnotes and export the RTF file format—so all hyperlinks must be built up by laboriously scanning the help file text, identifying useful cross-references, and then meticulously formatting the hot spots and inserting the hidden context strings for the hyperlink targets. The help file author must rely on naming conventions and a good memory or some jury-rigged context-string tracking system to resolve hyperlinks correctly the first time, so that not too much time will be wasted chasing help file compiler error messages.

POP-UP WINDOWS The default type of hyperlink that I have already described behaves in a very straightforward manner—the contents of the help file viewer's main window are immediately replaced by the text of the topic that is the destination of the hyperlink jump. Unfortunately, there are many circumstances where this sort of hyperlink is jarring and

not very convenient, such as when you simply want to display the definition of a word or a reference for a citation without causing the user to lose his help file context. For this reason, the help file system provides an alternative hyperlink behavior called a pop-up window.

A pop-up window is something like a child window and something like an application-modal dialog. It is nonresizable with a thin border, and it has a drop shadow to make it stand out with a three-dimensional appearance. A pop-up does not have a title bar, a menu bar, or a control menu. The pop-up appears nearby—usually immediately below—the hot spot that invokes it, and is dismissed when the user clicks anywhere on the screen. An example of a pop-up window is shown in Figure 1.

Creating a pop-up window in your help file source is easy. The topic that will be displayed in the pop-up window is formatted just like any other topic—delimited by hard page breaks and identified by a context string in a # footnote. The only thing that you need to do differently from the hyperlinks, in fact, is to format the visible text portion of the hyperlink with a single underline instead of a double underline. The help file viewer then displays this text to the help file user with a broken underline instead of a solid underline, using a default color of green.

Pop-up windows have some severe restrictions. The first and most important restriction is that only one pop-up window can be on the screen at a time. Moreover, if the user clicks on a hot spot within a pop-up, the pop-up instantly disappears to make way for the topic that is the tar-

get of the hyperlink, and it cannot be recalled with the help viewer's history list or Back button. Pop-up windows cannot be moved or resized by the user, cannot be scrolled, and their size is constrained by the main help viewer window. If the topic text will not fit within the pop-up window, it is simply clipped.

SECONDARY WINDOWS The help system supports another kind of window, called a secondary window, that is somewhat more flexible than a pop-up window. Secondary windows are full-fledged resizable movable windows, with a title bar, control menu, and (whenever it's appropriate) a scroll bar, which can be controlled by hyperlinks and can persist on the screen independent of the main help window. Secondary windows are distinguished visually from the main help window by their lack of a button bar or menu bar; an example can be seen in Figure 2.

Although secondary windows are highly useful, they require a fair amount of planning and setup, and extreme care in the creation of hyperlinks. You declare your intent to use a secondary window by adding an entry to the [WINDOWS] section of the help project (.HPJ) file that controls the compilation of the help file. This entry takes the form

```
window-name = "windowtitle",
(x, y, width, height),
window-state, [(scrolling RGB)],
[(non-scrolling RGB)], on-top-state
```

The *window-name* is used to identify the secondary window type or *class* in the hidden text that is part of a hyperlink. It's possible to have up to five different secondary window types in addition to the help viewer's main window. The *x,y*-coordinates give the initial position of the upper left corner of the secondary window on the screen. The position, *width*, and *height* are specified in help-system coordinates that always view the screen as 1,024-by-

1,024 units regardless of the actual number of pixels. The *window-state* indicates whether the window is initially maximized, the *on-top-state* does what you would expect, and the optional *scrolling RGB* and *nonscrolling RGB* parameters can be used to control the background colors that will appear in the secondary window.

For example, the following entry in an .HPJ file would declare a secondary window type named *auxwin* that has a title bar containing "EXELOOK Auxiliary Help," is not maximized when it appears, does not stay on top, uses the default background colors for both scrolling and nonscrolling regions, and is initially positioned and sized to occupy the upper left quadrant of the screen:

```
auxwin = "EXELOOK Auxiliary Help",
(0, 0, 512, 512), 0, , , 0
```

When you create a hyperlink and want the topic that is the target of the hyperlink to be displayed in a secondary window rather than the main window, you simply append the character > and the name of the secondary window to the context string that identifies the target topic—all formatted as hidden text, of course, immediately after the double-underlined nonhidden text that appears to the user as the hot spot. To jump back from a secondary window to the main help window, you just code a hyperlink context string that ends with this hidden text:

```
>main
```

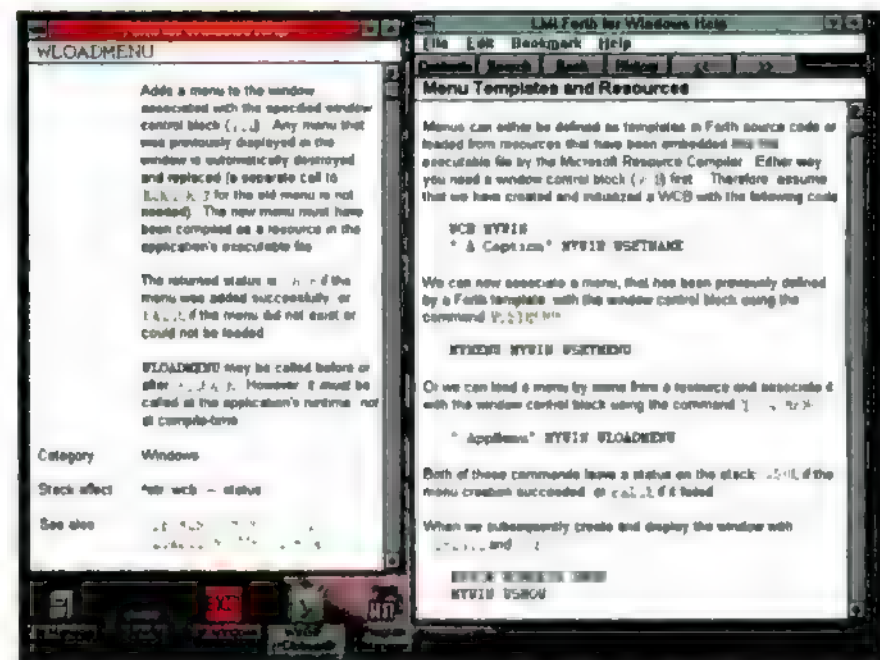


Figure 2: Secondary windows provide somewhat more flexibility than pop-ups, but they require far more planning to implement.

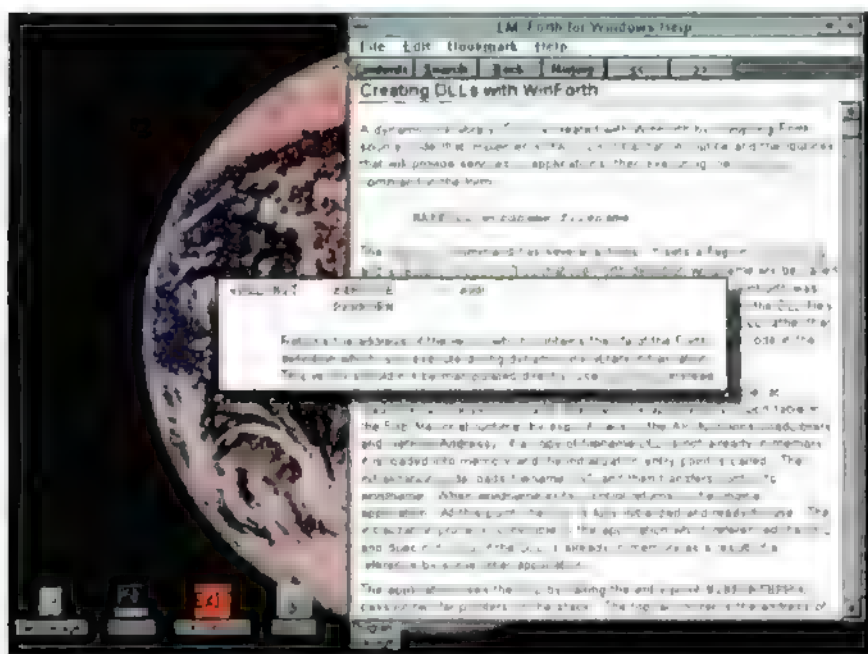


Figure 1: The Windows help file system provides an alternate way to display hyperlinked topics: pop-up windows. Here's an example.

Secondary windows have their limitations, too, although they are not nearly so dire as those of pop-up windows. Only one secondary window can be on the screen at a time, the secondary window can be closed unexpectedly by the user, it's difficult to control or close the secondary window once it is opened from within the help file itself, and topics that are displayed in the secondary window do not appear in the help viewer's History window.

BITMAPS Bitmaps are a wonderful way to make your help file more useful and attractive. You can capture entire screen dumps, or the contents of your program's window, to the system clipboard with the **PrtSc** or **Alt-PrtSc** key combinations, then use the resulting bitmaps to illustrate your help file and show the help file reader exactly what you are talking about. You can also design little icons and buttons with any bitmap editor and use them in your help file as decorations or as graphical hot spots. Take a look, for instance, at Figure 3, where a help file embeds one of the common dialogs as a graphic within a discussion of how to use that dialog.

In programmer lingo, bitmaps can be incorporated into your help source either by *value* or by *reference*. When you want to embed a bitmap by value, the easiest method is to copy it onto the system Clipboard one way or another (for example, by reading a bitmap file into Paintbrush, then choosing **Select-All** and **Edit-Copy**), followed by pasting it directly into your word processing document at the desired insertion point. (This assumes, of course, that your RTF-capable word processor supports such graphics shenanigans—

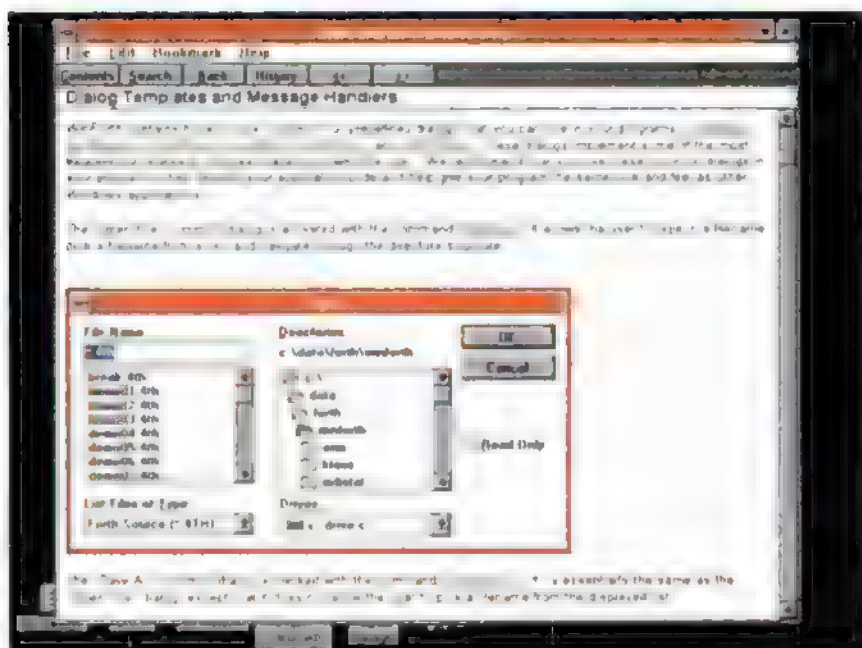


Figure 3: An example of a bitmap used in a Windows help file.

Bitmap-by-Reference Commands

COMMAND	DEFINITION
bmc	Character bitmap: The bitmap is treated as though it were a single character in the stream of text, and positioned on the same baseline. To save space, a single copy of the bitmap is stored in the help file separately from the text and shared by all bmc commands that reference that bitmap.
bml	Left-aligned bitmap: The bitmap is aligned at the left margin, and any text in the same paragraph is flowed around the right side of the bitmap. Storage is in the same fashion as bmc.
bmr	Right-aligned bitmap: The bitmap is aligned at the right margin, and any text in the same paragraph is flowed around the left side of the bitmap. Storage is in the same fashion as bmc.
bmcwd	Character bitmap: This works like bmc, except that a separate copy of the bitmap is stored together with the text each place it is referenced to improve performance.
bmlwd	Left-aligned bitmap: This works like bml, but storage is in the manner of bmcwd.
bmrwd	Right-aligned bitmap: This works like bmr, but storage is in the manner of bmcwd.

Figure 4: When you embed a bitmap into a help file by reference, you just insert one of these special commands into the help source that indicates the name of the file containing the bitmap, how the bitmap is to be aligned in the displayed text, and how it is to be stored.

Word for Windows, luckily, does.) This approach has the advantage of giving you a better idea of what the final compiled help file will look like, but it bloats the document file and slows the word processor horrendously.

When you embed a bitmap into the help file by reference, you just insert a special command into the help source that indicates the name of the file containing the bitmap, how the bitmap is to be aligned in the displayed text, and how it is to be stored. At help file compilation time, the help file compiler interprets this command, retrieves the bitmap from the separate file, and incorporates it into the forming help file.

The bitmap-by-reference commands take the following form:

```
{command filename.bmp}
```

where *command* is one of the commands listed in Figure 4. For example, to include the file MYMENU.BMP in your help file as a left-aligned bitmap, you would insert the following command in the help file source:

```
{bml mymenu.bmp}
```

Note that the bitmap-by-reference commands are not formatted as hidden text. Bitmaps

can be turned into hyperlink hot spots, on the other hand, by the simple expedient of underlining the bitmap-by-reference command (double-underlining for a normal hyperlink, or single-underlining for a pop-up window), and then inserting the context string for the destination of the hyperlink as hidden text after the bitmap command.

The more you use bitmaps in your help files, the more you'll like them, and the more quickly you'll run up against the help compiler's rather severe memory limitations on bitmaps. The help compiler simply gives up when it encounters bitmaps that are greater than 64K when compressed, but the compression factor is difficult to predict in advance. There is also, in the DOS version of the help compiler, a remarkably low limit on the total kilobytes of bitmaps that can be processed in a single compilation; this limit seems to be about 320K on my own machine, even though the machine has huge amounts of expanded and extended memory available. Microsoft claims that the OS/2 version of the help compiler is less limited, but my own experiences with the OS/2 version have not been very favorable.

THE IN BOX Please send your comments, suggestions, or questions to me at any of the following e-mail addresses:
 PC MagNet: 72241,52
 MCI Mail: rduncan
 Internet: duncan@cerf.net □

DUSTIN DOES CD-ROM



\$85

World Atlas MPC

World and regional maps, tables, statistics, conversion tables and national anthems make this program educational & entertaining.

MULTISESSION PHOTO CD-ROM DRIVE

- 350MS Access Time
- Interface & Cables
- 150K Transfer Rate
- 32K Buffer
- XA Ready
- MPC Compliant

\$199
INTERNAL



\$239

Grolier's MM Encyclopedia
Grolier's entire encyclopedia on CD-ROM with thousands of new articles, photos and sounds.

DOS ● WINDOWS ■ MPC + MAC ▲ HARDWARE ★

Drives and Kits

NEC CDR-74-1 ★	669
NEC CDR-84-1 ★	599
NEC Express PC ★	449
NEC Multimedia Gallery PC ★	925
Pro Audio Spectrum Fusion 16 ★	CALL
Procom Mitsumi Bundle Internal ★	399
Procom Toshiba Bundle Internal ★	769
Procom (LMSI) Internal ★	269
Procom (LMSI) External ★	299
Procom (Mitsumi) Internal ★	199
Procom (Mitsumi) External ★	259
Procom (Sony 31a) Internal ★	275
Procom (Sony 31a) External ★	315
Procom (Toshiba 3401) Internal ★	485
Procom (Toshiba 3401) External ★	599
Sound Blaster MM Upgr. Kit Int ★	CALL
Sound Blaster MM Upgr. Kit Ext ★	CALL
Texcel 3024 w/interface ★	519
Texcel 5024 w/interface ★	615

SOFTWARE BUNDLES

WINPACK

\$69

Mavis Beacon Teaches Typing
Chessmaster 3000 MPC
US Atlas MPC & World Atlas MPC
Power Tools
Procomm Music Sampler

**WINPACK WITH
GROLIER ENCYCLOPEDIA**
\$99

DOSPACK

\$75

US Atlas & World Atlas
Game Pack 2
Power Tools
Procomm Music Sampler
Secret Weapons

**DOSPACK WITH
GROLIER ENCYCLOPEDIA**
\$119

BUNDLES ARE AVAILABLE ONLY WITH THE PURCHASE OF SELECTED CD-ROM DRIVES

Accessories and Sound Cards

Labtec SS700 Speakers ★	39	Sound Blaster Deluxe ★	89
MS Sound System ★	195	Sound Blaster Pro Deluxe ★	135
Pro Audio Spectrum 16 ★	199	Sound Blaster 16 ASP ★	239
Pro Audio Spectrum Studio 16 ★	235	Voice Blaster ★	59
SCSI Cards ★	CALL	There are hundreds more accessories!	

Software

Animals. The +	799
Chessmaster 3000 +	599
Compton's Family Encyc. +	1959
Corel Draw 4 ■	CALL
Desert Storm +	399
Grolier's MM Encyclopedia +	2399
Kodak Photo Access Software +	399
Loom ●	559
MS Beethoven +	599
MS Bookshelf +	1399
MS Cinemania +	599
MS Encarta +	2599
MS Video +	1399
Pro Phone ('93) ●	1259
Seventh Guest +	699
Street Atlas USA ■	999
US Atlas +	399
Where in the World (DLX) ●	659
Windows Master ■	399

We have lots more
drives in
stock!

We have hundreds of
software titles in
stock!

**SAME DAY SHIPPING •
FREE GROUND SHIPPING**

CIRCLE 243 ON READER SERVICE CARD

Mon thru Fri 6AM to 5PM, Sat 10AM to 2PM PST

1-800-274-6611

20969 Ventura Blvd., Woodland Hills, CA 91364 818-710-9174



Plain Wrap Prices,
Black Tie Service.

**CALL FOR FREE CATALOGUE
& ANY ITEMS NOT LISTED**

FAX your order 24-hours

1-818-884-5310

Prices subject to change without notice



The Purchasing Source for Direct Buyers

- *2,500 products to choose from*
- *Dozens of America's Top Direct Marketers*
- *Great Value for Your Money*
- *Service & Support Experts*
- *Fast Delivery*



INDEX

Systems	
Ariel Design, Inc.	370
Austin Computer Systems	375
COMPUTER DISCOUNT	
WAREHOUSE.....	393
Comtrade	381
EPS Technology	383
Expo Tech	372,406
Global Horizons, Inc.	423
Insight Distribution	
Network	398
PCs Compleat	402
Tangent Computers	368
Tri Star Computers.....	384
USA Flex.....	386

Software/Peripherals/Components	
Amdek	420
Arlington Computer	
Products	418
Buffalo Products.....	424
Bulldog Computer	
Products	422
Compuclassics	419
Computability	408
COMPUTER DISCOUNT	
WAREHOUSE.....	393
Computer Express	410

DacEasy, Inc.	425
Dustin Discount	
Software	362,366
First Source International	414
Global Horizons, Inc.	423
H. Co Memory Upgrades	421
LA Trade	416
Midwest Computer	
Works	412
Pacific Wave	413
PCs Compleat	402
TELEMART	417
Worldwide Technologies	411

Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

PCs

MEMORY PARITY ERRORS IN WINDOWS

❗ I read your discussion of memory parity errors in the December 8, 1992, issue, but I still have a question. I have been plagued by memory parity errors also, but only when running Windows 3.1. I haven't seen any DOS parity error messages, nor has my system ever rebooted by itself. Why am I only getting these errors in Windows?

Toivo S. Aijo
Long Beach, California

► **PC MAGAZINE:** The most likely culprit is still a bad chip. The problems probably don't show up when you're running DOS applications, because they aren't trying to use the part of memory where the bad component is located.

Typical Windows installations have at least 2MB of memory and, since increased amounts of memory can significantly improve Windows' performance, many have 4MB, 8MB, or more. With this much memory, the odds are that a bad chip will fall outside of the first megabyte.

Most DOS programs use only the first 640K of memory. Even if they use extended or expanded memory above the first megabyte of RAM, it's only to hold data.

On the other hand, Windows uses all your system's memory, including memory located above the 640K DOS limit. Unlike DOS applications that use this memory for data only, Windows uses it for program code as well. Since program instructions are executed from this location, Windows exercises the chips much harder than a typical DOS application would. And Windows often uses *all* of your memory (something DOS programs rarely do); it resorts to your system's swap file only after all available memory has been used. Thus, Windows is more likely to run into a faulty chip.

Our Advisors

Douglas Boling is a contributing editor and the author of many utilities, including MBOOT.COM and EMS40.SYS.

Frank J. Derfler, Jr., is senior networking editor and the author of the *PC Magazine Guide to Connectivity*.

Alfred Poor is a contributing editor and the author of the *Hewlett-Packard LaserJet Printer Handbook*.

Jeff Prosser is a contributing editor and the author of the *PC Magazine Guide to DOS 5 Memory Management*.

Sal Ricciardi is a contributing editor and the author of the forthcoming *Running FoxPro* books from Microsoft Press.

Neil J. Rubenking is technical editor and the author of two Turbo Pascal books and *PC Magazine DOS Batch File Lab Notes*.

Joe Salemi is a contributing editor and the author of the *PC Magazine Guide to Client/Server Databases*.

Luisa Simone is a contributing editor and the author of the book *Microsoft Publisher*.

Craig Stinson is a contributing editor and coauthor of *Running Windows 3.1* and *Running Microsoft Excel*.

M. David Stone is a contributing editor and coauthor of *Word for Windows Companion*, Second Edition.

Ethan Winer is a contributing editor and the author of *PC Magazine BASIC Techniques and Utilities*.

You might not think that a bad chip is the source of the problem, however, since the computer always checks its memory when you turn it on. The fact of the matter is that the Power On Self Test (POST) for microcomputers is notoriously superficial. It does little more than

count fingers and toes to make sure that all the parts are there, and does not check thoroughly that those parts are operating correctly.

The best solution is to get a diagnostic utility that exercises every portion of your computer's memory to make sure that it's functioning correctly. CheckIt, QAPLUS and Sleuth are a few good examples.

Some users may be concerned that a subtle memory conflict, such as improperly configured upper memory blocks, could be causing a parity error. According to a source at Microsoft, there haven't been any reports of this, and it's far more likely that a bad chip is causing the problem.—*Alfred Poor*

Peripherals

THE THIN GRAY LINE

❗ I have a new Sony monitor that usually provides an excellent image, except that sometimes there seems to be a thin, gray horizontal line running across the entire screen. What could be causing this? Do you think I should return the monitor and ask for a new one?

Bob Kramer
New York, New York

INDEX

PCs

Memory parity errors
in Windows 364

Peripherals

The thin gray
line 364
Retrieving lost
printer labels 365
Understanding
monitor
specifications 365

Operating Environments

Eliminate bad
commands 369

Moving the Windows
swap file 369

Word

Processing
Template files
in WordPerfect 371
A WinWord
row- and column-
adding shortcut 371

Spreadsheets

A Retrieve command
for Excel 373

Databases

Debugging strategies
for FoxPro 374

Graphics

Unmasking
Illustrator's
masks 382

Networking

Quicker network
printing 385
Microwave
interference 385

Languages

Reading and setting
file attributes
in BASIC 385

► **PC MAGAZINE:** Many users prize Sony monitors and others that use the Trinitron display tube technology. On most systems, images are sharp and bright, and the cylindrical cross section of the screen makes the glass surface flat along the vertical dimension, reducing glare.

Some users believe that their monitors are defective, however. When running Windows—or some other application that fills the screen with a white background—they see a faint gray, horizontal line running from the left edge of the screen to the right, about one third of the way up. When a program is run that uses a black or dark background, however, the line seems to disappear. On the other hand, many users never even notice the line until someone points it out to them.

The line is not the result of a manufacturing defect. It's an artifact of the tube's design. A thin wire is used inside the tube to tension the shadow mask just inside the screen's front surface. This wire intercepts the stream of electrons headed from the tube's electron guns, blocking them from reaching the phosphors on the inside of the screen. In effect, it casts a shadow, just as when an object blocks the light from a light source.

So, there's nothing wrong with these monitors. If you're considering a monitor based on Trinitron technology, be sure to look at a sample while it's running the applications you intend to use, and at the same resolution. This will give you the opportunity to decide whether the shadow bothers you, before you buy.
—Alfred Poor

RETRIEVING LOST PRINTER LABELS

► **PC MAGAZINE:** You probably read the admonition in your printer manual about the types of labels you can use safely in your printer. But you had an important mailing to get out, you didn't have the right labels, and you figured it was worth the risk.

You fed ten labels into the printer, but only nine came out. Now what?

The fact is that labels rarely misfeed in printers, but when they do, it can be a nightmare. They jam the paper path,

putting your printer out of commission until you get them out.

Dot matrix printers with rolling platens are generally easy to fix, since the platen can often be removed quickly so you can get at the sticky culprit. Reaching the lost label in laser printers and fixed-platen printers can be a bit trickier, however, and may require some disassembly. (If you aren't comfortable handling small screws and putting puzzles back together without directions, it might be a good idea to get professional assistance for these printers.)

With either type of printer, the key is to release the label's hold on the printer's parts. Most label adhesives can be dissolved using a lightweight oil; a penetrating oil like WD-40 or plain salad oil should do the job. Small amounts of these oils aren't likely to harm your printer, and can soften the adhesive enough so you can remove the label.

When you've extracted the label, wipe up any excess oil you can reach. Be sure to run a few pages through your printer to make sure the blockage has been completely removed and that no blobs of oil remain to spoil a printed page.

—Alfred Poor

HOW TO CONTACT US

Do you have a hardware, software, or systems problem you can't solve? Do you have a tip you think other readers could use? Or maybe you'd like a better understanding of how something works. If so, we invite you to let us know about it. Our experts can give you practical solutions to your problems, provide techniques for using your software and hardware more productively, and help you grasp computer concepts and understand the latest technology.

It's easy to contact us. Just send us your submission (use ASCII format for text files) via the medium that's most convenient for you:

U.S. Mail: Solutions, *PC Magazine*, One Park Ave., New York, NY 10016-5802. (Please send a floppy disk along with a printout.)

Fax: 212-503-5799

MCI Mail: Solutions, 556-3896

CompuServe Mail: 72241,104

PC MagNet: Select Submissions to PC Magazine from the main PC MagNet menu. Upload your file to the most appropriate library. If at any time you need help, simply type a question mark (?) and hit Enter; a list of commands will be displayed. If you are not already a member of PC MagNet but would like to join, follow the instructions on page 12 to find your local access number.

CompuServe Members: If you're a CompuServe member, you can join PC MagNet by typing GO PCMAG at any CIS prompt.

For any tip we print, you'll receive \$50 plus a *PC Magazine* T-shirt. We regret that we cannot answer letters individually.

UNDERSTANDING MONITOR SPECIFICATIONS

❓ I want a new monitor to go with my Super VGA card, but I'm confused by the monitor specifications. The one I want lists a horizontal scan frequency of "27 to 57 kHz" and vertical frequencies of "31.5 to 90 Hz." Will I be able to run this at 800-by-600 resolution with a 72-Hz refresh rate?

Harry Goldman
Albany, New York

► **PC MAGAZINE:** When scan rates are listed as ranges, it can indeed be confusing. The key is to focus on the horizontal rates, and in this case, they can tell you that the monitor should work with your card.

With the emphasis these days on reducing monitor flicker, most users know that they want to use as fast a vertical refresh rate as possible. The vertical refresh rate is defined as the number of times per second that the image is painted on a screen. Lower refresh rates tend to produce a noticeable flicker in the image.

The VESA standard calls for 72-Hz

No strings attached.

DOS ● WINDOWS ■ MPC +
O/S2 ♦ HARDWARE ★

ACC PAC BPI Series ● CALL
ACC PAC Simply Acctg ● 135
DAC Easy Accounting 4.3 ● 105
DAC Easy Bonus Pack ● 135
DAC Easy Payroll 4.3 ● 69
DAC Easy Point of Sale ● 99
MS Money ■ 25
MS Profit ■ 135
Peachpay ● 55
Peachtree Accounting ■ 85
Peachtree Complete ● 195
Quickbooks ● 95
Quicken 2.0 ● 49
Quicken 6.0 ● 49
Quickpay ● 45

ABC Flowcharting ■ 309
CA Cricket Paint ■ 99
CA Cricket Graph ■ 89
CA Cricket Presents ■ 129
WP Presentation ■ 295
Flowcharting 3 ● 145
Formfiller 3.0 ● 89
Formtool Gold 3.0 ● 65
Freelance Graphics ■ 349
Freelance Graphics Upgrd ● 109
Harvard Graphics ● 409
Harvard Graphics ■ 369
Labels Unlimited ● 69
MM Make Your Point ■ 75
Perform ■ 195
Powerpoint For Windows ■ 325
Stanford Graphics ■ 359
Visio ■ 199

Autosketch 3.0 ● 155
Design CAD 2D ● 185
Design CAD 3D ● 259
Design CAD Professional ● 595
Drafix CAD Ultra ● 259
Easy CAD 2 ● 109
Generic 3D Drafting ● 215
Generic CAD 6.0 ● 295

Procom (LMSI) Internal ★ 269
Procom (LMSI) External ★ 299
Procom Mitsumi Bundle Int. ★ 399
Procom Toshiba Bundle Int. ★ 799
Procom (Sony 31a) Internal ★ 275
Procom (Sony 31a) External ★ 335
Sound Blaster MM
Upgr. Kit Int./Ext. ★ CALL
Procom (Toshiba 3401) Int. ★ 475
Procom (Toshiba 3401) Ext. ★ 585
Mitsumi CRMC ★ 239
NEC CDR-74 ★ 659
NEC CDR-84 ★ 589
NEC Express PC ★ 449
NEC Multimedia Gallery PC ★ 869

Mitsumi CRMC ★ 239
NEC CDR-74 ★ 659
NEC CDR-84 ★ 589
NEC Express PC ★ 449
NEC Multimedia Gallery PC ★ 869

Call for great bundle prices on
CD-ROM drives and software. We
have hundreds of CD titles in stock.

Animals, The ♦ 79
Chessmaster 3000 ♦ 59
Compton's Family Encyc. ♦ 195
DOSPACK #1 Bundle ● 75
DOSPACK #2 Bundle ● 119
Grier's MM Encyclopedia ♦ 229
MS Beethoven ♦ 59
MS Bookshelf ♦ 139
MS C. nermania ♦ 59
MS Encarta ♦ 269
MS Video ♦ 139
Pro Phone ('93) ● 125
Seventh Guest ♦ 69
Street Atlas USA ■ 99
US Atlas ♦ 39
Where in the World (DLX) ● 65
Windows Master ■ 39
WINPACK #1 Bundle ■ 69
WINPACK #2 Bundle ■ 99
World Atlas ♦ 85

There are hundreds more
cd titles in stock!

Carbon Copy Plus ● 145
Crosstalk 2.0 ■ 105
Hyperaccess 5 ● 69
Hyperaccess 5 ■ 135
Lantastic Products ■ CALL
Laplank Pro 5.0 ● 109
Novell Products ● CALL
PC Anywhere 4.5 Host/Rmt ● 119
Procomm Plus ● 79
Procomm Plus ■ 99
Q-Modem Pro ■ 65
Wildcat BBS ● 89
Windows For Workgroups ■ CALL
Winfax Pro ■ 89
WordPerfect Office PC ● 95

Access ■ CALL
Approach ■ 269
Approach Comp. Upgrade ■ 109
CA Clipper ● 499
CA Clipper Tools ● 445
CA Ret/XBase ■ 195
Clipper Comp. Upgrade ● 159
DataPerfect ● 245
Databoss ●
DB Fast ■

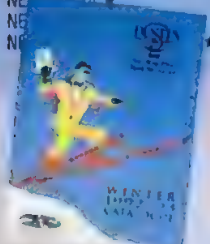
CA Ret/XBase ■ 195
Clipper Comp. Upgrade ● 159
DataPerfect ● 295
Databoss ● 249
DB Fast ■ 339
dBase IV ● 519
FileMaker Pro ■ 225
Foxpro 2.5 ● 329
Foxpro 2.5 6-User Pack ■ 585
Foxpro 2.5 Distribution Kit ■ 335
Instant Database ■ 79
Paradox ■ CALL
Paradox LAN Pack ●
Paradox Upgrade ●
PC-File ●
Q & A 4.0 ●
R&R Report Writer
Superbase 2.0 ■
By Design for W
Express Publisher
Facelift For WP ●
Fontminder ■
Fontmonger ■
Freehand ■
GOCR 2.0 ■
Infinity Plus ■
OmniPage Pro ■
Pagemaker ■
PFS First Graphics ●
Postscript Cartridge ★
Printshop Deluxe ●
MS Publisher ■
Masterpiece True Ty
Recognita + Americas
Recognita + English ■ 259
Recognita + Int'l ■ 419
True Type Fonts (Upgr Sys) ■ 59
Ventura Publisher 4.1 ■ 545
Automap ■ 53
Automap Europe ● 75
Auto Insight ■ 55
Body Works ● 43
Chemistry Works ● 43
City Streets ■ 65
French Assistant ● 69
German Assistant ●
Home Medical Advisor ●
Italian Assistant ●
Knowledge Adventure ●
New Car Finder ●
Orbits ●
PC Study Bible ●
Power Translator ●
Science Advn ●
Space Advn ●
Spanish ●

Cricket Paint ■ 99
Effects Specialist ■ 119
Designer ■ 469
Dr. Halo IV ■ 79
File Desktop Integer ■ 89
Harvard Draw Upgrd ■ CALL
Harvard Draw ■ 189
Hijaak ● 135
Illustrator ■ 389
New Printshop ● 45
Photofinish ■ 129
Photostyler ■ 549
Publishers Paintshop 2.0 ■ 295
Windows Draw ■ 99
CALL
Press Book ■ 65
Super Pro ■ 499
To Date ■ 99
Crescent Now
Object 2
Manage Pro
On Target
On Time
On Time
Pack R

OS/2 ♦ 155
OS/2 Upgrade ♦ 109
PC DOS 5.0 ● 149
PC DOS 5.0 Upgrade ● 69
SCO Unix/Xenix CALL
Windows 3.1 ■ 99
Windows 3.1 Upgrade ■ 59
Ballpoint Mouse ★ 129
Expert Mouse ★ 105
Mouseman ★ 79
MS Mouse ★ 89
PC Primetime ★ 489
Scanman Mode 256 ★ 275
Video Clipper ★ 439
Borland C++ ■ 349
Borland C++/W/APP ■ 519
MS C/C++ Compile ■ 329
MS Visual Suite ■ 265
Multimedia Tool ■ 529
Quick Basic ■ 75
Quick C ■ 75
Smalltalk ■ 299
Smalltalk ■ 85
Toolbook ■ 299
Turbo C ■ 115
Turbo C ■ 75
Turbo C 1.70 ■ CALL
CALL J
139
39

By Design for WP ■ 65
Express Publisher ■ 109
Facelift For WP ● 79
Fontminder ■ 65
Fontmonger ■ 105
Freehand ■ 409
GOCR 2.0 ■ 109
Infinity Plus ■ 65
OmniPage Pro ■ 649
Pagemaker ■ 529
PFS First Graphics ● 65
Postscript Cartridge ★ 259
Printshop Deluxe ● 55
MS Publisher ■ 139
Masterpiece True Type ■ 45
Recognita + Americas ● 309
Recognita + English ■ 259
Recognita + Int'l ● 419
True Type For 'Upgr Sys' ■ 545
4.1 ■ 532

By Design for WP ■ 65
Express Publisher ■ 109
Facelift For WP ● 79
Fontminder ■ 65
Fontmonger ■ 105
Freehand ■ 409
GOCR 2.0 ■ 109
Infinity Plus ■ 65
OmniPage Pro ■ 649
Pagemaker ■ 529
PFS First Graphics ● 65
Postscript Cartridge ★ 259
Printshop Deluxe ● 55
MS Publisher ■ 139
Masterpiece True Type ■ 45
Recognita + Americas ● 309
Recognita + English ■ 259
Recognita + Int'l ● 419
True Type For 'Upgr Sys' ■ 545
4.1 ■ 532



Call for free catalogue

THE DUSTIN
Free Ground Shipping
Same Day Shipping • Overnight Delivery Available • Easy Shipping To Canada •
Corporate PO's, APO's & FPO's Welcome • Government & Educational Pricing • Visa, MC & AMEX.

Dustin delivers.

9Recognita + English ● 259
9Recognita + Int'l ● 419
nTrue Type Fonts (Upgr Sys) ● 59
eVentura Publisher 4.1 ● 545

Automap ● 53
Automap Europe ● 75
Auto Insight ● 55
Body Works ● 43
Chemistry Works ● 43
City Streets ● 65
French Assistant ● 69
German Assistant ● 69
Home Medical Advisor ● 65
Italian Assistant ● 69
Knowledge Adventure ● 49
Kew Car Finder ● 35
Orbits ● 33
PC Study Bible ● CALL
Power Translator ● 179
Science Adventure ● 49
Space Adventure ● 49
Spanish Assistant ● 69
Sports Adventure ● 49
The Playroom ● 35
The Treehouse ● 45
Typing Tutor VI ● 39
Where is Carmen Series ● CALL

Blackjack ● 35
MS Entertainment Pack ● CALL
Capitalist Prg ● CALL
Falcon 3.0 ● 55
Flight Simulator 4.0 ● 49
Black Nicklaus Unltd Golf ● 45
Junks 386 Pro ● 49
SimCity ● 39
SimEarth ● 49
Tetris ● 29
Thrustmaster ★ 89
Ultimate Golf ● 39

Corel Draw 3.0 ● 139
Corel Draw 4.0 ● CALL
Crocket Paint ● 99
Effects Specialist ● 119
Designer ● 469
Dr. Halo IV ● 79
Halo Desktop Imager ● 89
Harvard Draw Upgrade ● CALL
Harvard Draw ● 189
Hijaak ● 135
Illustrator ● 389
New Printshop ● 45
Photofinish ● 129
Photostyler ● 549
Publishers Paintbrush 2.0 ● 295
Windows Draw ● 99

1st Act ● 59
Act! ● CALL
Address Book Plus ● 65
ACA Project ● 499
ACA Up To Date ● 99
Calendar C ● 49
CDescrip ● 65

Info Select 2.0 ● 99
Lotus Organizer ● 99
Manage Pro ● 239
On Target ● 269
On Time ● 85
On Time ● 49
Pack Rat ● 249
Planmaker ● CALL
Policies Write Now ● 109
PowerLeads ● 199
MS Project ● 329
MS Project ● 455
Timeline ● 485
Write Your Congressman ● 35

Borland Super Pack ● 199
Enable Works ● 75
Lotus Works ● 99
MS Office ● CALL
PFS:First Choice ● 99
Simply Business Bundle ● 425
Smart Suite ● 469
Smart Suite Upgrade ● 349
Stepway ● 55
Symphony 2.2 ● 515
Works ● 139
Works ● 105

Derive 2.0 ● 155
Execustat ● 295
Mathcad 3.0 ● 319
Mathmatica 386/387 ● 849
Statgraphics 5.1 ● 689
Systat Dual ● 745

Courier HST 16.8 Ext. ★ 655
Courier HST 16.8 Int. ★ 575
ESP ● 189
Hayes Smartmodems ★ CALL
Modem Sharing Kit ★ 679
Optima 144 + Fax 144 ★ 499
Optima 96 + Fax 96 ★ 399
PM14400FX Send/Rec Fax ★ 389
PM9600 V.32/V.42 BIS ★ 299
Pocket Edition 2400 ★ 115
Sportster 9600 ★ 319
Ultra 144 ★ CALL
Ultra 96 ★ 699
WorldPort 2400 ★ 149

Desqview 2.4 ● 85
Desqview 386 ● 139
Dr DOS Multiuser 5.1 ● 489
MS DOS 6.0 ● CALL
New Wave ● 119
OS/2 ● 155
OS/2 Upgrade ● 109
PC DOS 5.0 ● 149
PC DOS 5.0 Upgrade ● 69
SCO Unix/Xenix ● CALL
Windows 3.1 ● 99
Windows 3.1 Upgrade ● 59
Ballpoint Mouse ★ 129
Ernart Mouse ★ 105
79

Expert Mouse ★ 105
Mouseman ★ 79
MS Mouse ★ 89
PC Primetime ★ 469
Scanman Mode 256 ★ 275
Video Clipper ★ 439

Borland C++ ● 349
Borland C++W/App ● 519
MS C/C++ Compiler ● 329
MS Visual Suite ● 265
Multimedia Toolkit ● 529
Quick Basic ● 75
Quick C ● 75
Smalltalk ● 299
Smalltalk V ● 85
Toolbook ● 299
Turbo C++ ● 115
Turbo C++ ● 75
Turbo Pascal 7.0 ● CALL
Visual C++ ● 139
Visual Basic ● 139
Visual Basic Pro Toolkit ● CALL
Windows SDK ● 235
Zortech C++ ● 475

Galaxy Sound Cards ★ CALL
Labtec SS700 Speakers ★ 39
Midi Mate ★ 55
Pro Audio Spectrum Plus ★ 145
Pro Audio Spectrum 16 ★ 199
Sound Blaster Deluxe ★ 89
Sound Blaster Pro Deluxe ★ 135
Sound Blaster 16 ASP ★ 239
Trantor T-130 SCSI Cards ★ CALL

There are hundreds more accessories!

123 for Home ● 99
CA Compete ● CALL
Excel ● 319
Excel Comp Upgrade ● 129
Improv ● 109
Lotus 123 Upgrade ● 99
Lotus 123 V3 4 ● 419
Lotus 123 ● 349
Lotus 123 V2 4 ● 349
Lucid ● 45
PlanPerfect ● 245
Quattro Pro ● CALL
Quattro Pro Upgrade ● CALL

386 Max ● 69
After Dark ● 35
Battery Boost ● CALL
Check It ● 89
Copy II Deluxe Option Board ● 145
Copy II PC 6.0 ● 39
Dashboard ● 49
Direct Access ● 59
Fastback Plus ● 109
Full Armor ● 59
Help ● CALL
Lightup ● 79

Mac in Dos ● 99
Midi Made Music ● 29
MS Productivity Pack ● 49
Netroom ● 69
Norton Antivirus ● 95
Norton Back-Up ● 95
Norton Desktop ● 119
Norton Utilities ● 119
PC Kwik Powerpak ● 85
PC Tools Deluxe 8.0 ● 139
Pentacalc ● 45
Pentacalc/Dashboard Bundle ● 69
PK Zip ● 55
Power Search ● 65
Print Cache ● 99
Q DOS III ● 55
QEMM 386 ● 65
Spinrite II ● 69
Stacker 3.0 ● 99
Stacker Upgrade ● 59
Star Trek Screen Saver ● 45
Super PC Kwik ● 55
Superstor Pro ● 95

Winmaster ● CALL
Xtra Drive ● 65
X Tree ● 75
X Tree Gold 2.5 ● 99
Ami Pro V3 0 ● 249
Ami Pro V3 0 Upgr ● 99
CA Textor/Grammatic Bndl ● 99
Grammatik ● 69
Lotus Write ● 135
MS Word ● 229
MS Word ● 319
MS Word Upgrade ● 129
Professional Write ● 175
Screen Extender For WP ● 65
Wordperfect ● CALL
WordPerfect ● 279
WordPerfect MLP ● CALL
WordPerfect Upgrade ● CALL
Wordstar ● 285



Plain Wrap Prices,
Black Tie Service.

20969 Ventura Blvd., Woodland Hills, CA (818) 710-9174

Call Toll Free from anywhere in the United States

Mon thru Fri 6AM to 5PM, Sat 10AM to 2PM PST

1-800-274-6611

Or Fax Your Order!

1-818-384-5310

We will promptly replace any defective items returned within 30 days, but cannot guarantee compatibility. There is a 15% restocking fee on any non-defective, unopened goods, and all returns must be accompanied by a Returned Merchandise Authorization. Software prices do sometimes fluctuate beyond our control and may change, for better or worse, without notice. While ground shipments are free, we do ask \$11.00 per item for 2-day, \$22.00 per item for overnight, and \$4.50 for C.O.D. Although shipping heavier items may be slightly more, bulk orders can be a lot less. Free catalogues are available upon request, and please call us for any item not listed.

DIFFERENCE

Call for Any Item Not Listed

No Credit Card Surcharges • 24-Hour FAX Order-Line • Latest Versions

Thousands of Items in Stock • Manufacturers' Warranties & Documentation • Call for Free Catalogue

CIRCLE 347 ON READER SERVICE CARD



TANGENT FIRST AGAIN!

With All-New **RAID-6** Servers!



EDITOR'S CHOICE AWARDS

THE SAFEST & FASTEST RAID YET!

We've Engineered RAID-6 to provide you with:

- UNSURPASSED SURVIVABILITY OF MULTIPLE DRIVE FAILURES
- PROTECTION AGAINST HOST ADAPTER FAILURES
- FAR GREATER PROTECTION THAN RAID-5
(RAID-5 Can Self-Destruct in the Event of Multiple Drive Failures)
- UP TO 17.5 MB/sec DATA AVAILABILITY SUSTAINED
- OPTIMIZED DISK ARRAY PERFORMANCE
 - Duplexing • Striping • Scatter/Gather • Disconnect/Reconnect
- FASTER WRITE SPEED THAN RAID-5



400-80 OCT 1996
400-80 JUN 1996

Featuring TANGENT's Unique:

- SUPERIOR MEMORY SUBSYSTEMS

- Expandability to 256MB of System RAM
- 1MB of 1520ns SRAM

Giving You The Industry's Fastest Memory & Disk Cache Buffers
30% Faster & 4-Times Larger than the Competition!

We'd More Security:

- TANGENT'S NEW DUALIE™ OFFERS
 - Dual Motherboards • Dual Power Supplies • Dual Host Adapters
 - Fully RAID-6 Compliant

CUSTOM-ENGINEERED NETWORKS!

At Tangent you won't buy from just salespeople. You'll talk directly to our certified engineers—trained experts in developing turnkey network solutions.

With Tangent you get:

- NETWORKS SUPPORTING UP TO 1,000 NODES
- EXCLUSIVE PLATINUM INSTALLATION
- COMPLETE NETWORK TRAINING
 - LANs • UNIX • NFS • Network Management
- YOUR CHOICE OF OPERATING SYSTEMS

- Get Up & Optimized with the Industry's Hottest
 - Novell NetWare 3.11/4.0 • Windows NT • Sun Solaris
 - Novell UnixWare • IBM Q/52 Lan Server
 - You Name It & We'll Load, Configure & Test It!



400-80 MAR 1996
400-80 FEB 1996



NOVELL



2.1GB RAID-6 SERVER 3.4GB RAID-6 SERVER

- | | |
|-------------------------------------|-------------------------------------|
| • Intel PENTIUM 60MHz | • Intel PENTIUM 60MHz |
| • 800-6000000000 WARRANTY (3YR) | • 100-6000000000 WARRANTY (3YR) |
| • 10MB FDISK | • 10MB FDISK |
| • 8 EISA SLOTS | • 8 EISA SLOTS |
| • 2 EISA CACHING HOST ADAPTERS | • 2 EISA CACHING HOST ADAPTERS |
| • FAST 32-BIT EISA ETHERNET ADAPTER | • FAST 32-BIT EISA ETHERNET ADAPTER |
| • 160K 1520ns CPU CACHE | • 160K 1520ns CPU CACHE |
| • PENTIUM UPGRADABLE | • PENTIUM UPGRADABLE |

\$9,995

\$15,995

4 Year Work & Cost Based Warranty (3YR) Starting at \$4,995
1 Year 24/7 On-Site Support & Service (3YR) Starting at \$299

SERVICE YOU CAN DEPEND ON!

Anyone can sell you a box and call it a server. Not Tangent. We listen carefully to what your requirements are and custom-design networked systems that give you optimal results with maximum reliability. Every Tangent system is fully-tested to ensure that you get continuous dependability long after your purchase.

Service plans providing as quick as one hour response are available. At Tangent we'll tailor a service plan designed to fit your specific requirements.

Backed By Over 600 CNEs Nationwide!

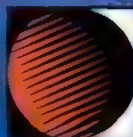
Call Tangent for a Winning Deal Today!



800-800-6060



CIRCLE ONE ON READER SERVICE CARD



TANGENT
COMPUTER

GS4# GS00K91AG55212

100 Airport Boulevard, Burlingame, CA 94010
415/343-6366 • FAX 415/343-6366

42 Tangent servers are available with a full range of options. All specifications and prices subject to change without notice.

Copyright 1996 Tangent Computer Corporation. All rights reserved. TANGENT, PENTIUM is a registered trademark of Intel Corporation. All other trademarks are owned by their respective companies.

Resolution and Scan Rates

Resolution	Scan Rates	
	Vertical (Hz)	Horizontal (KHz)
640-by-480	60	31.5
	70	35.5
	72	37.7
800-by-600	56	35.5
	60	37.9
	70	44.2
	72	48.4
1,024-by-768 (noninterlaced)	60	48.0
	70	56.0
	72	58.0
	87 (interlaced)	35.5

Figure 1: As this chart shows, for a given vertical scan rate, the higher the resolution, the higher the horizontal scan rate must be (because there are more lines to paint on the screen in a given vertical scan period). And for a given resolution, the higher the vertical scan rate, the higher the horizontal scan rate must be (there is less time to paint the lines on a screen because the vertical scan-rate period is shorter).

refresh at 800-by-600 and 1,024-by-768 resolutions, noninterlaced. But a monitor that reportedly handles up to 90-Hz vertical refresh rates may not give the flicker-free image that you expect. To see the whole picture, you need to look at both the horizontal and vertical scan rates. The horizontal scan rate is defined as how many times per second the monitor's electron beam starts over at the left edge of the image.

The actual frequencies used may vary slightly from one card design to the next. Figure 1 lists the different scan rates required for some common resolutions.

To run a video card at 800-by-600 resolution, with a 72-Hz vertical scan rate to minimize flicker, the monitor would have to handle a 48.4-kHz horizontal rate. These values both fall within the ranges Mr. Goldman stipulates.

On the other hand, assume we have a monitor that specifies 60- to 90-Hz vertical refresh rates, but only 31.5- to 35.5-kHz horizontal scan rates. The vertical numbers look good enough to cover 1,024-by-768 noninterlaced, but when you look at the horizontal range, the monitor falls short. With a maximum of 35.5-kHz horizontal rate, the only way the monitor can handle a 1,024-by-768 signal is as an interlaced signal. Sure, it can refresh the screen up to 90 times per second, but because of the limitations of

the horizontal scan rate, it will only be able to do half the image at a time. This requires an interlaced image signal, which effectively reduces the refresh rate to 45 Hz or less and can lead to significant flicker problems. If you want to run this same monitor in 800-by-600 mode, the best you can expect is a vertical refresh rate of 56 Hz, which is also likely to produce noticeable flicker.

So make sure your monitor can handle the scan frequencies produced by your video adapter in the resolution modes you intend to use. The critical specification is the horizontal scan rate range. It often pays to spend a little more to get a higher vertical scan rate so you won't have to deal with

flicker problems.—*Alfred Poor*

Operating Environments

ELIMINATE BAD COMMANDS

❓ Perhaps you can explain the "Bad command or filename" message that frequently appears on my screen. The major applications I've installed are Windows 3.1, The Norton Utilities 6.01, The Norton Desktop for Windows, Stacker, and Central Point Backup. When I boot up, the message appears immediately after the line "The memory-resident portion of SMARTDrive is loaded"; then it appears again after Norton's "Finished updating IMAGE for drive C:" and again whenever I exit Windows.

Can you explain what's happening, and what I should do to correct it?

*Allan Rosenberg
Boynton Beach, Florida*

► **PC MAGAZINE:** When DOS processes a command line, whether it's one you typed at the prompt or a line in a batch file, it goes through several steps to interpret the command that starts the line. If DOS 5.0's DOSKEY utility is loaded, DOS first checks to see whether the command matches a DOSKEY macro name.

Next it compares the command against its list of internal commands. If the name doesn't match a DOSKEY macro or internal command, DOS starts looking for an external program. It looks in the current directory for a matching .COM, .EXE, or .BAT file, in that order. Next it searches the directories on the PATH, again seeking matching .COM, .EXE, and .BAT files. If this whole process turns up nothing that matches the command, DOS gives up and displays the message "Bad command or filename."

That's what's happening and what it means. As for what you should do to correct it, start by deleting the @ECHO OFF line in your AUTOEXEC.BAT. Reboot and watch carefully to see exactly what command immediately precedes the bad command message. If the messages fly past too quickly, insert the PAUSE command between every few lines of your AUTOEXEC and try again. In this way, you'll determine exactly which lines are causing the problem.

Now try those problem lines "by hand" at the DOS prompt to see what's wrong. Perhaps the command is misspelled in your AUTOEXEC.BAT, or perhaps the program's directory isn't on the PATH. Once you can correctly load the program from the DOS prompt, edit your AUTOEXEC file to incorporate the corrections and restore the @ECHO OFF line.—*Neil J. Rubenking*

MOVING THE WINDOWS SWAP FILE

❓ The permanent swap file created in Windows 3.1 is placed as an unmovable file anywhere on a hard disk, usually at the beginning of free file space. Subsequent file-writing operations embed this file and make housekeeping operations more difficult. Is there a way to force the file to the end of the disk?

*Manfred Lichtensteiger
Woburn, Massachusetts*

► **PC MAGAZINE:** A Windows 3.1 swap file must be physically continuous, so its location and maximum size will depend on how fragmented your disk is. The only way to force the swap file into a particular location on the disk is to make *no* other

PC's For Powerful Tastes.

ARIEL'S HOUSE SPECIALITIES

VL-BUS Power Stations

486SX-33VLB* \$1995

486DX-33VLB* \$2195

486DX2-66VLB* \$2595

Micronics VL-Bus, 256k Cache
6 Bay Tower; 250 Watt PS
4 Meg 70ns RAM
1.2 and 1.44 MB TEAC FDD
245 Mb Maxtor IDE Hard Drive
Volante™ Warp10LB S3805
Accelerator, 1 Mb VRAM
ViewSonic 6E NI 14" Color VGA
MS Mouse, 2-S Ports, 1-P Port
Keytronics 101 Key Keyboard
MS DOS 6.0, MS Windows 3.1
Choice of Borland Software
PENTIUM™ upgradable

VL-BUS SCSI Stations

486DX2-66VLS* \$3795

Micronics VL-Bus 256k Cache
6 Bay Tower Case, 300 Watt PS
8 Meg 70ns RAM
1.2 and 1.44 MB TEAC FDD
525 Mb Fujitsu SCSI Hard Drive
UltraStor 34F VL-Bus SCSI Contrl.
SIXGRAPH Wizard 9000 VL
Graphics Accelerator 2Mb VRAM
ViewSonic 6E 14" NI Color VGA
MS Mouse, 2-S Ports, 1-P Port
Keytronics 101 Keyboard
MS DOS 6.0, MS Windows 3.1
Choice of Borland Software
PENTIUM™ upgradable

EISA/VL-BUS SCSI Stations

486DX2-66EVS* \$4995

AMI Enterprise III, 256k Cache
8 Bay Tower Case, 300 Watt PS
8 Meg 70ns RAM
1.2 and 1.44 MB TEAC FDD
877 Mb Toshiba
SCSI Hard Drive
AMI EISA/SCSI
Caching Controller,
386SX-16/4 Mb RAM
SIXGRAPH Wizard 9000 VL
Graphics Accelerator 2Mb VRAM
ViewSonic 6FS 15" NI Color VGA
MS Mouse, 2-S Ports, 1-P Port
Keytronics 101 Keyboard
MS DOS 6.0, MS Windows 3.1
Choice of Borland Software
PENTIUM™ upgradable



Customized Systems

EISA/VL-BUS DX2-66 SYSTEMS

Two of the 8 EISA slots are also VL-Bus slots. Systems support PENTIUM™ upgrades. Basic systems include an AMI or Micronics motherboard, case, power supply.

Hardware Choices

SCSI CONTROLLERS Choose the UltraStor 34F VESA/SCSI Controller, or an American Megatrends EISA SCSI caching controller.

MULTIMEDIA SCSI Double Speed CD ROM's from NEC; TEXEL; Toshiba; these support the Kodak multisession Photo CD standard.

MONITORS ViewSonic 6E, 6FS, 7 and 8; as well as NEC monitors.

HARD DRIVES IDE drives up to 520MB and SCSI up to 2.1 Gb.

GRAPHICS CARDS Choose from the S3 based Volante Warp10, the ATI Ultra Pro VL-Bus, and a new Weitek 9000 based graphics cards.

Software Options

BORLAND SOFTWARE With each VL-Bus system you may choose:

Quattro® Pro for Windows;
Borland® C++® for Windows/
DOS; or Paradox® for Windows.

IBM OS/2 Ariel will help you configure your operating system.

WINDOWS FOR WORKGROUPS The \$150 option includes Ethernet card and the software installed.

OS/2 Work Station

486DX-50ES* \$4596

486DX2-66ES* \$4695

Micronics EISA, 512k Cache
8 Bay Tower Case, 300 Watt PS
8 Meg 70ns RAM
1.2 and 1.44 MB TEAC FDD
1.2Gb Toshiba SCSI Hard Drive
2-S Ports, 1-P Port
AMI EISA/SCSI Controller
Volante™ Warp10 S3801
ViewSonic 6FS 15" NI Color VGA
MS DOS 6.0, MS Mouse
Keytronics 101 Keyboard
IBM OS/2 2.0
PENTIUM™ upgradable

*Contains Intel 486 Microprocessor



Ariel 486SX/25
October 13, 1992



Best Value Award
September, 1992

*Think of Ariel as
your favorite cafe
where the selections
are fresh with the
latest technology.
Where a
knowledgeable staff
serves award
winning systems
and indulges your
tastes - made to
order at its best.*



Ariel Design, Inc.
COMPUTER SOLUTIONS

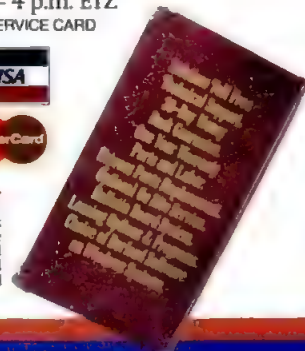
800-952-7435

145 Webster Street Hanover MA 02339
617/982-8800 FAX: 617/982-9095
Mon - Fri 9 - 7 Sat 11 - 4 p.m. ETZ

CIRCLE 209 ON READER SERVICE CARD



Prices and specifications are subject to change without notice. Prices do not include shipping. The Intel Inside Logo is a trademark of Intel Corporation. OS/2 and OS/2 are registered trademarks of the International Business Machine Corp. Other brands and product names are trademarks or registered trademarks of their respective companies.



EATDISK.PAS

Complete Listing

```

PROGRAM EatDisk;
  (First parameter is number of kilobytes to "eat",
   second is directory in which to create EATDISK.$$$
   e.g. EATDISK 4096 D:\ to eat 4M on drive D:)
VAR
  HowMuch : LongInt;
  Code    : Integer;
  F       : File;
BEGIN
  IF ParamCount > 1 THEN
    BEGIN
      Val(ParamStr(1), HowMuch, Code);
      IF (Code = 0) AND (HowMuch > 0) THEN
        BEGIN
          Assign(F, ParamStr(2)+'EATDISK.$$$');
          Rewrite(F, 1);
          Seek(F, (HowMuch * 1024) - 2);
          BlockWrite(F, Code, 2);
          Close(F);
        END;
      END;
    END;
  END.

```



Figure 2: This tiny program is one way to eat up disk space, forcing Windows to locate its permanent swap file at the end of the disk.

location possible. Start by getting rid of any existing permanent or temporary swap file. Bring up the Control Panel and open the 386 Enhanced icon. Press the Virtual Memory button, and press the Change button in the dialog that appears. Select None in the Type combo box. After you confirm that you want to make a change, you'll be prompted to restart Windows—don't do it! Instead, exit Windows entirely.

Now use *PC Magazine's* DEFRAGR (February 23, 1993) or a similar program to defragment the target disk, and restart Windows. Then just fill up the disk until only the amount of space you want for the swap file remains. There are a number of ways you can do this; one method is to create a document in your word processor and keep doubling its size using cut-and-paste. Or you can use the tiny Pascal program shown in Figure 2 to eat up disk space in increments of 1K. (You can download the source code and executable files from PC MagNet, archived as EATDIS.ZIP.) The program will compile under either the DOS or Windows versions of Borland's Pascal compiler. Invoke it by passing the number of kilobytes to grab and the directory in which to place its temporary file. If the parameters are valid, the program creates EATDISK.\$\$\$ in the specified directory with the specified size; if not, it does nothing.

Note that the size will round up to the cluster size of your hard disk, typically 2K. For example, to consume 4 megabytes on drive D:, use the command EATDISK 4096 D:\.

When the space remaining on the target drive has been reduced to the desired swap file size, bring up the Virtual Memory dialog from Control Panel's 386 Enhanced utility again. Press Change, then set the Drive combo box to the target drive and the Type combo box to Permanent. The Space Available and

Maximum Size lines should both display the desired swap file size. Enter this value on the New Size line and press OK. You'll get a warning that Windows won't use the specified size—ignore it. When you're prompted to restart Windows, select Continue instead. Delete EATDISK.\$\$\$ and then restart Windows.

If the Maximum Size line doesn't show the same value as the Space Available line, it's almost certainly because your disk has a bad sector in the area targeted for the swap file. Just about every disk has one or more bad sectors; it doesn't mean there's anything wrong with the disk. But since the permanent swap file must be physically continuous on-disk, it cannot contain any bad sectors. You'll simply have to accept another location for your swap file.

—Neil J. Rubenking

Word Processing

MERGING TEMPLATE FILES IN WORDPERFECT

TIP The Working Word columns in the February 11 and September 15, 1992, issues discuss WordPerfect macros that let you load files to use as templates without

risking overwriting the originals. Another alternative for loading the templates is for the macro to run a merge. To create the macro, start the Macro Define feature, then type Ctrl-F9, and pick Merge. Enter the drive, path, and filename for the template file in response to the prompt for the Primary file, and simply hit Enter to respond to the prompt for a Secondary file. The macro you wind up with will take the form

```

(Merge/Sort)MFilePathAndName(Enter)
(Enter)

```

When you run this, the macro will merge the file into the current document screen, so if you start in an unnamed document, you'll wind up with an unnamed document.

Mark W. Petersmeyer
Libby, Montana

► **PC MAGAZINE:** Choosing between this approach and the one discussed in the earlier columns is a classic case of "six of one, half a dozen of the other." Both approaches will work in either Version 5.0 or 5.1, and both provide essentially the same functionality for using template files. The advantage of this approach is that it is identical to the procedure you can use for a fill-in-the-blanks form to ask for input from the keyboard at merge time—using the Input field in Version 5.1 (entered with Shift-F9, I) or the ^C marker in Version 5.0 (entered with Shift-F9, ^C). This lets you use one approach for two similar procedures.

Note that whether you use the Merge command as shown here, or the Retrieve command as discussed in earlier columns, the macro will merge the template file into the currently open document, even if there is already data in the document.—M. David Stone

A WINWORD ROW- AND COLUMN-ADDING SHORTCUT

TIP When editing a Word for Windows 2.0 table, you can insert new columns or rows by placing the cursor in the appropriate row or column and clicking on the Table button in the Toolbar. WinWord will respond with a dialog box that lets



expo NOTE 386sx/33

- 33Mhz 80386sx CPU
- 640x480 VGA screen with 64 levels of grey plus concurrent VGA external monitor port
- 1.44 Meg Floppy
- External Keyboard port
- Only 2.1"(H) x 11.4"(W) x 9.25"(D)
- Multi I/O (2 Serial, 1 Parallel)
- MS-DOS
- Complete Power Management functions
- Dual Voltage A/C Adapter included
- Weighs less than 7lbs
- 2 Mb RAM, 80 Meg Hard Drive

"You'll find as much high-performance components in the Expo 486dx2/50 as the company could possibly cram inside the slim-line case"

PC Magazine
Feb 23, 1993

"You may not have heard of Expotech, but you may be glad you did"

Windows Sources
Feb 1993

JUST **\$999**

1.800.284.3976 in Canada 1.800.685.8284

Software, Modem & Service Package for Desktop & Tower Systems Only. All Prices, Availability, and Specifications subject to change without notice. Please call to confirm pricing, IL Sales Tax, Availability, and Warranty Details.

CIRCLE 003 ON READER SERVICE CARD

expotech

We have sold over 1 million systems because we offer you value, quality and a dependable support system.

expotech

is one of the fastest growing computer organizations in the United States.

We got that way by giving our customers the **Best Service - Best Support - and the Best Value.** Other computer companies may come and go but Expotech is a member of the VTech computer group which has been around for 10 years and has manufactured over 1 million computers. Expotech maintains three research laboratories to give you the best technology at the lowest cost. Furthermore, Expotech's configuration facility is second to none with **most systems shipping the same day we receive credit approval.** At Expotech we believe the customer comes first. That's why we have toll free customer support, a toll free fax line, and support via Prodigy. Plus, with every Expotech 486 Desktop we include Remote Diagnostics.

**Call today...open 7 days a week
Central Standard Time**

Monday - Friday 7am - 8:30pm
Saturday 9am - 6pm Sunday 10am - 3pm

expotech

113 McHenry Road
Buffalo Grove, IL 60089

1.800.284.EXPO

FAX 1.800.947.EXPO

**GOVERNMENT & EDUCATION 1.800.947.8481
CANADA 1.800.685.8284**

Word Processing...Spreadsheets

you specify whether to enter a cell, row, or column.

But there's also an easier way. Say you want to add a new row. Select the row in the position where you want to insert the row. If you want the new row to be the second row, for example, select row two. Then click on the table button, and WinWord will insert the row without stopping to show you a dialog box. The same approach works for columns. Simply select a column in the position where you want a blank column and click on the Table button.

Juan Antonio Pena
Bowling Green, Kentucky

► **PC MAGAZINE:** Although this shortcut doesn't seem to be mentioned in the WinWord manuals, it's actually a straightforward extension of the underlying feature. After all, if you select only part of a row or column before giving an insert command, there's no way for WinWord to determine whether you plan to insert rows, columns, or cells, except by asking you to fill in the answer in a dialog box.

If you've highlighted one or more entire rows, in contrast, the only choice is to insert rows. Similarly, if you've highlighted one or more entire columns, the only choice is to insert columns. This technique works for inserting multiple rows or columns as well as for one at a time. Simply select the same number of rows or columns you want to insert.

Keep in mind that selecting an entire row is not the same as selecting all the cells in a given row. To select a row with the mouse, move the mouse cursor into the invisible selection bar to the left of the table. (You'll know you're there when you are clearly to the left of the leftmost cell, and the mouse cursor shows as a right-pointing arrow.) Move the pointer alongside the row you want to select, and click the left button. If you want to select more than one row, hold down the button as you extend the selection.

Likewise for columns, move the cursor just above the top of a cell; the cursor changes to a downward pointing arrow, and if you click the left mouse button, you'll select the entire column. If you hold the mouse button down, you can move to the right or left to select additional columns.

Keyboard users can take advantage of a similar shortcut. To select one or more rows from the keyboard, move the cursor to highlight any cell in the first row you want to select, extend the selection to additional rows if you like, then choose Table | Select Row, then Table | Insert Rows. To insert one or more columns, move the cursor to any cell in the first column you want to select, extend the selection to additional columns if you like, then choose Table | Select Column, Table | Insert Column.—*M. David Stone*

Spreadsheets

A RETRIEVE COMMAND FOR EXCEL

✓ **TIP** I recently switched from Quattro Pro to Excel, and one thing I miss is Quattro Pro's File | Retrieve command. I would often use this command to replace one file with another. So, I decided to write an Auto_Open macro that would put this command on all of Excel's File menus. The macro is shown in Figure 3.

Cells A8:D8 (the range named Retrieve) define the menu command Retrieve, and cells B1:B5 add it to all menu bars except number 3, which is only visible when all files are closed and thus doesn't need a Retrieve command. The File_Retrieve section, B10:B14, carries

out the command's work. It first closes the current file. Then it presents the standard File | Open dialog box. If the user selects and opens a file, the macro skips to its RETURN statement at B6. If the user cancels out of the Open dialog box, the macro uses NEW(1) to open a fresh worksheet.

It is conceivable that at some point I may not wish these commands to appear. The result is the macro at B16 named Return_Menus, which restores all of Excel's default menu bars. To simplify changing things around, I set up the Return_Menus macro to be invoked by Ctrl-Z.

Gregg J. Hommel
Kitchener, Ontario, Canada

► **PC MAGAZINE:** In my opinion, the addition of a Retrieve command provides a real enhancement to Excel's user interface. We don't *always* work with two or more files at once, after all. Many, if not most, users typically work with only one file at a time. When they're through with that file, they want to get rid of it and load another. In Excel's native menu tree this entails two operations, a close and an open. Why not combine the two with a Retrieve command?

Mr. Hommel's macro has one flaw: It closes the current document before it presents the Open dialog box. If an errant mouse stroke puts you in the Retrieve command by accident, your Cancel click

RETRIEVE.XLM

Partial Listing

	A	B	C	D
1	Auto_Open	=ADD.COMMAND(1,"File",Retrieve,"Close")		
2		=ADD.COMMAND(2,"File",Retrieve,"Close")		
3		=ADD.COMMAND(4,"File",Retrieve,"Close")		
4		=ADD.COMMAND(5,"File",Retrieve,"Close")		
5		=ADD.COMMAND(6,"File",Retrieve,"Close")		
6		=RETURN()		
7				
8	&Retrieve...	retnve.xlm!File_Retrieve		Close Active File and Open Another
9				
10	File_Retrieve	=CLOSE()		close the current file
11		=OPEN?		open file dialog box
12		=IF(B11=TRUE,GOTO(B14))		check for cancel
13		=NEW(1)		
14		=RETURN()		
15				
16	Return_Menus	=ADD BAR(1)		restore
17		=ADD BAR(2)		all menus
18		=ADD BAR(4)		to defaults
19		=ADD BAR(5)		
20		=ADD BAR(6)		
21		=SHOW BAR()		
22		=RETURN()		

Figure 3: This macro adds a Retrieve command to Excel's File menus.

RETRIEV2.XLM

Complete Listing

	A	B	C	D
1	Auto_Open	=ADD COMMAND(1,"File",Retrieve,"Close")		
2		=ADD COMMAND(2,"File",Retrieve,"Close")		
3		=ADD COMMAND(4,"File",Retrieve,"Close")		
4		=ADD COMMAND(5,"File",Retrieve,"Close")		
5		=ADD COMMAND(6,"File",Retrieve,"Close")		
6		=RETURN()		
7				
8	&Retrieve	retriev2 xlm!File_Retrieve		Close Active File and Open Another
9				
10	File_Retrieve	=ECHO(FALSE)		
11	Currentdoc	=GET.DOCUMENT(1)		
12		=OPEN?()		
13		=IF(B12=TRUE)		
14		= ACTIVATE(Currentdoc)		
15		= CLOSE()		
16		=END IF()		
17		=RETURN()		
18				
19	Auto_Close	=DELETE COMMAND(1,"File","Retrieve .")		Remove all Retrieve commands
20		=DELETE COMMAND(2,"File","Retrieve .")		
21		=DELETE COMMAND(4,"File","Retrieve .")		
22		=DELETE COMMAND(5,"File","Retrieve .")		
23		=DELETE COMMAND(6,"File","Retrieve..")		
24		=RETURN()		

Figure 4: This modification of RETRIEVE.XLM makes sure a new file is opened before closing the old one.

will get you a new blank worksheet, but it won't bring back the one you were working with. Simply reversing the order of the CLOSE() and OPEN?() commands in the macro's File_Retrieve section won't help, because the CLOSE() will then act upon the newly retrieved worksheet, rather than the one with which you're presumably finished.

Figure 4 shows how you can get around this problem with GET.DOCUMENT(1). This instruction returns the name of the current document. Then, assuming the user has actually opened a new file, the IF/END.IF block in B13:B16 activates and closes the document whose name is in B11. To reduce screen noise while all this activating and closing is going on, I've also included an ECHO (FALSE) statement in B10.

The cleanup macro listed in B16:B22 of Figure 3 could be made more versatile. You won't want the ADD.BAR statements in B16:B20 to restore Excel's factory-default menu bars if you use other macros or add-ins that modify Excel's standard menus. Rather than resetting the original menu bars, why not just delete the Retrieve commands? Figure 4 shows how to do that. In Figure 4, the cleanup routine has also been assigned the name Auto_Close so that it will run automatically whenever the macro sheet

on which it is stored is closed.

When recreating Mr. Hommel's macros (with or without my modifications) on your system, be sure to assign the name Retrieve to the range A8:D8. Then assign the other labels in column A to the adjacent cells in column B. For maximum convenience, you might want to save the macro in an add-in macro sheet (an .XLA) file and put it in your XLSTART directory. That way you won't ever have to look at it, and the File Retrieve command will become a permanent part of your Excel interface.

You can download both macros from the Utilities/Tips Forum on PC MagNet, archived as RETRIE.ZIP.

—Craig Stinson

▶ Databases

DEBUGGING STRATEGIES FOR FOXPRO

TIP I read "Debugging Using ON KEY LABEL" in the April 28, 1992, Databases column with interest because I use a similar method to debug my FoxPro applications.

The tip suggested using the following statement:

ON KEY LABEL F10 SUSPEND

to bind the SUSPEND command to the F10 key for use during debugging.

I take it a step further, however. Since FoxPro can read the DOS environment, I set up an environment variable that specifies whether or not to run the program in debugging mode. If the environment variable exists and has the right contents, I run a routine that sets things up for debugging. Since it's not likely that the target machine will have the same environment variable set up the same way, I usually leave the debugging code alone and let the environment specify whether or not to run the application in debug mode.

To do this, I place the following line in my AUTOEXEC.BAT:

```
SET MYDEBUG=xyz
```

Then I place the following code early in my main program:

```
IF GETENV('MYDEBUG') = "xyz"
  DO DEBUGON
ELSE
  DO DEBUGOFF
ENDIF
```

The DEBUGON procedure activates the Debug and Trace windows and moves them below the application's screen area. This assumes that the application runs in normal 80-character by 25-line mode and that 50-line (VGA) mode is available. It also assigns SUSPEND to the F9 key, and sets up Ctrl-PgUp and Ctrl-PgDn to call two routines, which I've named SLOWDOWN and SPEEDUP (shown in Figure 5).

The SLOWDOWN and SPEEDUP routines let me slow down or speed up my application as it's running in the Trace window. Slowing down a RESUME'd application makes it easier to see what's happening. By assigning these two routines to the Ctrl-PgUp and Ctrl-PgDn keys, I can adjust the speed of my Trace window interactively.

I use the F9 key to invoke the SUSPEND command instead of using F10 for two reasons. First, it's located at the left edge of the block of four keys on an enhanced keyboard (F9, F10, F11, F12),





Austin: Computers Powering the 21ST Century

The global strength of IPC comes to Austin—and you!

IPC is a *global* manufacturer of computer equipment, with over \$300 million in sales and 9 subsidiaries around the world.

IPC has invested in Austin as its U.S. subsidiary, and the synergy is sending shock waves through the industry. A computer company had to be damn good just to survive the last eight years, and Austin excelled! Just ask our customers, **a phenomenal 75% of whom are repeat buyers.** But now, with the backing of this global giant, nothing can stop us.

That's good news for Austin; good news for you. In fact, we're now unveiling our new Patriot line of PCs. Every one of these 486 computers features a VESA Local Bus Card for the same price as our competitors' regular systems. That's just one example of Austin's commitment to performance! If you're a Windows user, you'll see the difference **immediately.**

Powerful machines and leading-edge technologies. Great values at fair prices. **Service and support rated #1 by the toughest critics.*** That's the strength

Austin and IPC bring to you. And the source of the energy that will power technology in the 21st Century.



**486/DX2-50
VESA-LB
Patriot
\$1989**

- 1MB VL-Bus Windows Accelerator
- 4MB RAM
- 128K Cache
- 175MB Hard Drive
- 14" Super VGA Non-Interlaced Monitor
- Choice of Application Software
- DOS/Windows/ Mouse/AMI Diagnostics

**ORDER TOLL FREE
1-800-331-1701**

AUSTIN
AN IPC COMPANY

10300 Metric Blvd. • Austin, Texas 78758

**PC World, February 1993, Review of 486 Systems.*

© 1993 Austin Computer Systems. All Rights Reserved. Other product names or trademarks shown herein are for illustrative purposes only and may be the property of other companies. Prices and specifications are subject to change without notice. Prices listed are this month's specials only, and not the list price. Austin Computer Systems cannot be responsible for errors in typography or photography. Intel Inside/Intel logo is a trademark of Intel Corp.

CIRCLE 012 ON READER SERVICE CARD

PCM-F-3

Pumped-up performance. Pared-down prices.

RATED #1 IN 486 SERVICE AND SUPPORT*

Powerful systems. Leading-edge technology. Service and support rated #1 by PC World.* No wonder three out of four of our orders come from repeat customers.

To begin with, we offer award-winning machines at a fair price. We've won 5 PC Magazine Editor's Choice Awards in three years.

Each system is built to your exact order. We configure the system, format the hard drive and install your new software.

Plus, we use only top-notch components. For the price of our competitors' regular systems, we offer VESA Local Bus Systems. Windows users will see an **immediate** difference! Intel architecture and quality components make upgrades easier and lower your cost of service.

We also offer a 30-day money-back guarantee, two year parts and labor warranty and FREE, one-year on-site service. Extended warranties are also available.

ALL SYSTEMS INCLUDE THE FOLLOWING UNLESS NOTED:

1.44MB & 1.2MB Floppy Drives • 101-Key Keyboard,
Austin Mouse • Small Footprint Chassis
Pre-Installed MS DOS & Windows • A.M.I. Diagnostics



486/DX2-66 VESA-LB Patriot Plus

- 1MB VL-Bus Deluxe Windows Accelerator
- 8MB Memory
- 256KB Cache
- 340MB Hard Drive
- 15" NI Super VGA Color Monitor with Digital Controls
- ZIF CPU Socket
- Two VL-Bus Slots
- Choice of Lotus® Application Software

\$2899

486/DX2-50 VESA-LB Patriot Plus

- 1MB VL-Bus Deluxe Windows Accelerator
- 8MB Memory
- 256KB Cache
- 250MB Hard Drive
- 15" NI Super VGA Color Monitor with Digital Controls
- ZIF CPU Socket
- Two VL-Bus Slots
- Choice of Lotus® Application Software

\$2489

486/DX-33 VESA-LB Patriot

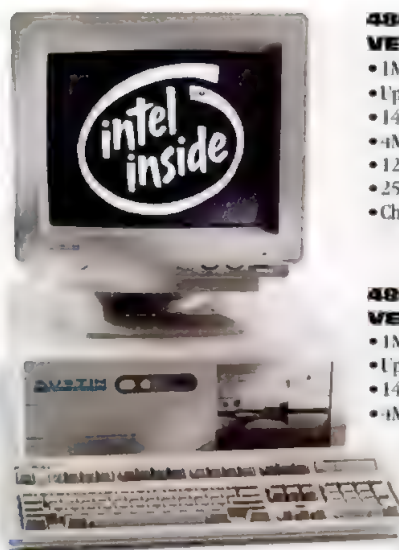
- 1MB VL-Bus Windows Accelerator
- Upgradeable CPU
- 14" NI Super VGA Color Monitor
- 4MB Memory
- 128KB Cache
- 250MB Hard Drive
- Choice of Application Software

\$1899

486/SX-33 VESA-LB Patriot

- 1MB VL-Bus Windows Accelerator
- Upgradeable CPU
- 14" NI Super VGA Color Monitor
- 4MB Memory
- 128KB Cache
- 250MB Hard Drive
- Choice of Application Software

\$1749



Canada 1-800-338-1565 • Overseas 1-512-339-3500 • FAX 1-512-454-1357

*PC World, February, 1994. Review of 486 Systems

© 1994 Austin Computer Systems. All Rights Reserved. Other product names or trademarks shown herein are for illustrative purposes only and may be the property of other companies. Prices listed are this month's specials only, and not the list price. Prices and specifications are subject to change without notice. Austin Computer Systems cannot be responsible for errors in typography or photography. There is no annual fee or minimum charge required for the Austin Computer Systems credit card and the annual percentage rate is 17.99%. Intel Inside trademark logo is a trademark of Intel Corp. Microsoft is a registered trademark and Windows and the Windows logo are trademarks of Microsoft Corp. Lotus is a registered trademark of Lotus Development Corp.

PCM-F-4



NO-PAIN, ALL-GAIN NETWORKS

And when it comes to network support, Austin's the best connection you can have. We're a Novell "Gold Authorized" Reseller, so we can provide turnkey network solutions anywhere in the U.S. We're also a Novell Labs Self-Certification & Testing Center. We can certify virtually any configuration of file server or workstation.

To monitor your system and stop problems before they happen, we now offer the most incredible support system in the industry, and our 'Remote Remedy' Program allows us to access your network over a modem and troubleshoot it as if we were actually sitting in your office. We offer toll-free technical support manned by Novell-certified technicians, and ongoing NetWare support is also available.

- NetWare installation...FREE!
- NetWare configuration...FREE!
- Consultation...FREE!
- NetWare support for 30 days...FREE!
- Login Scripts, User Names created...FREE!
- Menus, Print Queues created...FREE!



1 YEAR
ON-SITE SERVICE



2 YEAR
WARRANTY

2.4GB Fault Tolerant 486/DX2-66 EISA SuperServer

- Intel i486DX2 66MHz
- 16MB RAM (to 128MB)
- RAID 5 EISA Controller with 2.4GB Drive Array
- Three 1.2GB Hard Drives
- EISA Motherboard
- 32-Bit Austin Combo EISA Ethernet Adapter—10BaseT, BNC and AUI Connectors
- Tower Chassis
- 14" VGA Monochrome Monitor
- 1.2MB & 1.44MB Floppy Drives
- 1 Year On-Site Service
- 2 Year Parts and Labor Warranty

\$9999

486/SX-33 Ethernet Station

- Intel i486SX 33MHz
- 2MB RAM
- 1.2MB or 1.44MB Floppy Drive
- 14" Super VGA Color Monitor w/ 16-bit Windows Accelerator
- 4-Bay Small Footprint Chassis
- 101-Key Keyboard
- 16-bit Combo Ethernet Adapter Included—10BaseT, BNC and AUI Connectors
- DOS/Windows/Mouse
- Choice of Application Software
- 1 Year On-Site Service
- 2 Year Parts and Labor Warranty

\$1199



**CALL TOLL-FREE
1-800-331-1701**

AUSTIN
AN IPC COMPANY

10300 Metric Blvd. • Austin, Texas 78758

Foxpro Debugging Procedures

```

PROCEDURE speedup
PARAMETERS increment
IF (_THROTTLE + increment) >= 0    && Can't be less than zero
    _THROTTLE = _THROTTLE + increment
ENDIF
RETURN

PROCEDURE slowdown
PARAMETERS increment
IF (_THROTTLE + increment) < 5.6    && Can't be more than 5.5
    _THROTTLE = _THROTTLE + increment
RETURN

PROCEDURE debugon
SET DISPLAY TO vga50
ON KEY LABEL F9 SUSPEND
ON KEY LABEL Ctrl-PgUp DO SLOWDOWN WITH 0.1
ON KEY LABEL Ctrl-PgDn DO SPEEDUP WITH -0.1
ACTIVATE WINDOW Debug
ACTIVATE WINDOW Trace
ZOOM WINDOW Debug NORM FROM 26, 01 SIZE 66, 78
ZOOM WINDOW Trace NORM FROM 33, 01 SIZE 16, 78
RETURN

PROCEDURE debugoff
SET DISPLAY TO vga25
IF WVISIBLE('Debug')
    DEACTIVATE WINDOW Debug

```

```

ENDIF
IF WVISIBLE('Trace')
    DEACTIVATE WINDOW Trace
ENDIF
STORE 0 TO _THROTTLE
ON KEY LABEL Ctrl-PgUp *
ON KEY LABEL Ctrl-PgDn *
ON KEY LABEL F9 *
RETURN

REM
REM ALFATEST.BAT - Turn off debugging and run the application
REM
IF %1. == . goto :noname
SET OLDDEBUG=%MYDEBUG%
SET MYDEBUG=
REM Use FOXPRO or FOXPROL if you don't own the Distribution Kit,
REM or if you have built your application as an .EXE,
REM remove the word FOXR
FOXR %1
SET MYDEBUG=%OLDDEBUG%
SET OLDDEBUG=
GOTO :done
:noname
ECHO You didn't supply an application name to test!
:done

```



Figure 5: FoxPro routines and a batch file that enable or disable debugging under program control.

which makes it much easier to find. Second, the F10 key is often used to activate the menu bar.

The debug routines are defined here as procedures, but I actually store them in a subdirectory called \DEVELOP\COMMON as separate program files and reference them whenever I need a debug routine in an application. This will work if you are using the Project Manager in FoxPro 2.0.

The DEBUGOFF routine, of course, reverses all of the efforts made in DEBUGON.

Often while debugging an application on my development system, I'll need to run the application normally to see how it operates under real-life conditions. For this reason I have a batch file called ALFATEST, to which I pass the application name as a parameter. Its purpose is to save the state of the existing MYDEBUG environment variable and then nullify MYDEBUG so that I can run the application normally. When the application finishes, the batch file restores MYDEBUG to whatever it was set to previously.

*Richard A. Hurd
Nazareth, Pennsylvania*

► **PC MAGAZINE:** Everyone has a favorite approach to debugging. Using a DOS environment variable in this manner makes it easy to externalize the decision to enable or disable debugging logic embedded in your application. During the applica-

tion development process, this can be handy. However, once the application is stable and complete, you should remove the routines before producing the final shipping application. In general, if a debugging routine can somehow give the user access to things he or she shouldn't have access to, pull it out of a shipping application. No matter how well hidden, trap doors are an invitation to Murphy's Law. Exceptions to this rule are routines specifically designed for remote technical support, such as a procedure that provides status information without giving the user access to the command window.

Mr. Hurd uses several FoxPro features to make his environment more programmer-friendly. For example, there's the _THROTTLE system variable (see Figure 5). Normally, when the Trace window is open and you choose Resume, your application will execute at high speed until it reaches the next breakpoint. You can see FoxPro highlight each line as it executes (similar to the Animate capability in other debuggers), although it can be very difficult to keep up with FoxPro as it Traces through your program at full speed. That's where _THROTTLE comes in.

The _THROTTLE system variable stores a user-defined delay in seconds that occurs between every traced command. By setting _THROTTLE, you can slow down the Trace window to a speed that you're comfortable with. The tech-

nique presented here allows you to do this in small increments by hitting Ctrl-PgUp or Ctrl-PgDn.

New to FoxPro 2.0 is the ability to explicitly activate and deactivate the Trace and Debug windows under program control. Just use the window names Trace or Debug, as shown in the DEBUGON and DEBUGOFF procedures. You can also activate or deactivate the View window this way.

Mr. Hurd uses the SET DISPLAY and ZOOM WINDOW commands in to switch the display into 50-column mode and to move the Trace and Debug windows below line 25. This lets you view your application during debugging, unobstructed by the Trace and Debug windows.

Although a 50-line by 80-column display is handy for debugging, 50-lines by 120-columns is even better. If you have a multiscanning monitor and a VGA card, I highly recommend that you investigate Personics' Ultravision, a software utility that can provide you with enhanced display capabilities depending on your video card and monitor type. On my system I use Ultravision in combination with a NEC MultiSync 4D monitor and an old Video-7 VRAM VGA card to regularly run FoxPro in 120-by-50 mode. Since FoxPro automatically makes use of all your screen real estate, this setup provides lots of room for an 80-by-25 application as well as for the Debug, Trace,

Storm Windows! 62M WinMark!

THUNDEROUS SPEED WITH THE NEW GENERATION DIAMOND VIPER & S3 GRAPHICS ACCELERATION



EISA WinStation (VL-Bus)

- OverDrive Ready for Future Pentium Technology
- 256K Fast Cache SRAM & Expandable to 256K
- 4 MB RAM & Expandable to 128 MB
- 2 MB 3.5" & 44 MB 3.5" Floppy Drives
- 250 MB Ultra Fast 12ms IDE Drive with 64K Cache
- 32-Bit EISA Smart Cache IDE Hard Disk Controller (8,100KB/Sec DTR & Access Time down to 0.1ms)
- Bus WinPro S3-805 Graphics Accelerator
- 1MB RAM (Up to 1280x1024 & 16.7M True Colors)
- 14" CTX-1461 Non-Interfaced 28mm SVGA Monitor (1280x1024 with 20% larger edge to edge display)
- 2 Serial, 1 Parallel & 1 Game Ports
- Enhanced 101-key Keyboard & Serial Mouse
- Free Microsoft DOS 6.0 & Windows 3.1
- One Year Nationwide On-Site Service

486/33 DX \$1845
486/50 DX2 \$1945
486/66 DX2 \$2145

- VL-Bus Diamond Viper Accelerator (2MB) Add \$250
- 15" Flat Screen 1280x1024 MPR-2 Monitor Add \$430
- Upgrade to EISA Smart Cache HD Controller Add \$60

EISA Dream Machine (VL-Bus)

- OverDrive Ready for Future Pentium Technology
- 256K Ultra Fast Write Back Cache SRAM
- 8 MB RAM & Expandable to 128 MB
- 1.2 MB 5.25" & 1.44 MB 3.5" Floppy Drive
- 32-Bit EISA Smart Cache IDE Hard Disk Controller (8,100KB/Sec DTR & Access Time down to 0.1ms)
- 250 MB Ultra Fast 12ms IDE Drive with 64K Cache
- VL-Bus WinPro S3-805 Graphics Accelerator w/ 1MB RAM (Up to 1280x1024 & 16.7M Colors)
- 15" Flat Screen 28mm 1280x1024 SVGA Monitor (Low Radiation, 36% larger edge to edge display)
- 2 Serial, 1 Parallel & 1 Game Ports
- Enhanced 101-key Keyboard & Serial Mouse
- Free Microsoft DOS 6.0 & Windows 3.1
- One Year Nationwide On-Site Service

486/33 DX \$2245
486/50 DX2 \$2345
486/66 DX2 \$2545

- 17" Flat Screen 1280x1024 MPR-2 Monitor Add \$430
- VL-Bus Diamond Viper Accelerator (2MB) Add \$250

PC Sources Magazine's Best Choice!

ONCE AGAIN, "THE LIGHTNING COMTRADE PC" HAS THE COMPETITION RUNNING FOR COVER. IN REVIEW AFTER REVIEW, CRITIC'S APPLAUD COMTRADE'S THUNDERING SPEED AND EXTRAORDINARY VALUE. ACCORDING TO THE RECENT PC MAGAZINE, COMTRADE'S 486 SYSTEM "HAS THE PERFORMANCE AS FLEETED." IT'S NO WONDER COMTRADE IS AWARDED PC SOURCE MAGAZINE "DIRECT HIT" (BEST BUY/EDITOR'S CHOICE) (FEBRUARY 1993). "IT'S A VERY SWEET GRAPHICS MACHINE," SAYS COMPUTER SHOPPER (MAY 1992). "THAT DESERVES SERIOUS CONSIDERATION FROM ANYONE WHO WANTS TO JUST UP WINDOWS." COMTRADE'S LATEST 32-BIT VL-BUS WINPRO OR VIPER GRAPHICS ACCELERATORS ARE EVEN UP TO 3 TO 5 TIMES FASTER THAN OUR PREVIOUSLY REVEALED SYSTEMS AND AT A MUCH LOWER PRICE.

Comtrade's Thunderous VL-Bus Video

COMTRADE DIAMOND VIPER	62
COMTRADE WINPRO	50
GATEWAY ATI ULTRA PRO 28	

WinMark 2.5 Million pixels per second
Standard SVGA Monitor, 1M WinMark

Comtrade Zaps The Competition!

Processor Benchmark Test

AST	16213
COMTRADE	17200
DELL	16268
GATEWAY 2000	16400
ZENITH	15067
IBM	11525
THE REST	14000

Source: PC Magazine January 26, 1993



PEACE OF MIND • 30-DAY MONEY-BACK GUARANTEE • TWO-YEAR PARTS & LABOR WARRANTY • ONE-YEAR NATIONWIDE ON-SITE SERVICE • LIFETIME TOLL-FREE TECHNICAL SUPPORT • EXPRESS PARTS REPLACEMENT
CIRCLE 316 ON READER SERVICE CARD

EISA Local Bus WinStation

- OverDrive Ready for Future Pentium Technology
- 256K Fast Cache SRAM & Expandable to 256K
- 4 MB RAM & Expandable to 128 MB
- 2 MB 3.5" & 44 MB 3.5" Floppy Drives
- 250 MB Ultra Fast 12ms IDE Drive with 64K Cache
- 32-Bit EISA Bus Master SCSI-2 Cache HD Controller (20,000KB/Sec DTR & Access Time down to 0.1ms)
- Bus WinPro S3-805 Graphics Accelerator
- 1MB RAM (Up to 1280x1024 & 16.7M True Colors)
- 14" CTX-1461 Non-Interfaced 28mm SVGA Monitor (1280x1024 with 20% larger edge to edge display)
- 2 Serial, 1 Parallel & 1 Game Port
- Enhanced 101-key Keyboard & Serial Mouse
- Free Microsoft DOS 6.0 & Windows 3.1
- One Year Nationwide On-Site Service

486/33 DX \$1725
486/50 DX2 \$1825
486/66 DX2 \$2025

- 8 MB RAM & 250 MB 12ms Drive Add \$250
- 15" Flat Screen 1280x1024 MPR-2 Monitor Add \$430
- High Speed 150ms Medium CD-ROM Add \$125

EISA Bus-Master (VL-Bus)

- OverDrive Ready for Future Pentium Technology
- 256K Fast Cache SRAM & 2 VL-Bus Slots
- 8 MB RAM & Expandable to 128 MB
- 1.2 MB 5.25" & 1.44 MB 3.5" Floppy Drives
- 32-Bit EISA Bus-Master SCSI-2 Cache HD Controller (20,000KB/Sec DTR & Access Time down to 0.1ms)
- 540 MB 9ms SCSI-2 Drive with 256K Cache
- VL-Bus Diamond SpeedStar Pro Graphics Accelerator w/ 1MB RAM (Up to 1280x1024 & 16.7M True Colors)
- 14" CTX-1461 Non-Interfaced 28mm SVGA Monitor (1280x1024 with 20% larger edge to edge display)
- 2 Serial, 1 Parallel & 1 Game Ports
- Enhanced 101-key Keyboard & Serial Mouse
- Free Microsoft DOS 6.0 & Windows 3.1
- One Year Nationwide On-Site Service

486/33 DX \$2745
486/50 DX2 \$2845
486/66 DX2 \$3045

- 17" Flat Screen 1280x1024 MPR-2 Monitor Add \$520
- MultiMedia CD-ROM Package & 6 CD Titles Add \$44
- VL-Bus S3-805 Graphics Accelerator Add \$90

EISA Local Bus Tornado

- OverDrive socket for Future Pentium Technology
- 256K Fast Cache SRAM & Expandable to 256K
- 8 MB RAM & Expandable to 32 MB
- 1.2 MB 5.25" & 44 MB 3.5" Floppy Drives
- 250 MB Ultra Fast 12ms IDE Drive with 64K Cache
- 32-Bit EISA Bus IDE Hard Disk Controller
- VL-Bus WinPro S3-805 Graphics Accelerator
- 1MB RAM (Up to 1280x1024 & 16.7M True Colors)
- 15" Flat Screen 28mm 1280x1024 SVGA Monitor (Low Radiation, 36% larger edge to edge display)
- 2 Serial, 1 Parallel & 1 Game Ports
- Enhanced 101-key Keyboard & Serial Mouse
- Free Microsoft DOS 6.0 & Windows 3.1
- One Year Nationwide On-Site Service

486/33 DX \$2025
486/50 DX2 \$2125
486/66 DX2 \$2325

- 17" Flat Screen 1280x1024 MPR-2 Monitor Add \$430
- VL-Bus Diamond Viper Accelerator (2MB) Add \$250

1.800.969.2123



COMTRADE

"Where Quality is Everything"

International 818.961.6688
Fax 818.369.1479
Japan 0473.34.3700
Tech Support 800.899.4508
24-Hour BBS Service 818.891.6098
Hours: 7:00-7:00 Pacific Mon-Sat
15314 East Valley Boulevard
City of Industry, California 91746

Command, and View windows. Ultra-vision also provides some great looking replacement screen fonts. Personics can be reached in Maynard, Massachusetts, at 800-445-3311 or 508-658-0040. The procedures discussed in this article can be downloaded from PC MagNet. Look for the file FPDEBUG.PRG in the Utilities/Tips Forum.—*Sal Ricciardi*

Graphics

UNMASKING ILLUSTRATOR'S MASKS

❓ I meet with only limited success when I try to use Adobe Illustrator's masking function. What's the trick to getting consistent results when I create a masked object?

*Christina Howe
Bowling Green, Kentucky*

► **PC MAGAZINE:** You don't need a trick to make Illustrator's masking functions work properly. But to ensure that you meet all the conditions required for successful masking (and believe me, there are quite a few), you do need to understand exactly how Illustrator creates a mask.

Many vector-based drawing programs (those that, like Illustrator, rely on formulas for generating their lines and shapes rather than simply placing pixels on a page) offer masking functions. Vector masks are also known as clipping paths, because you use an outline (path)

to crop (clip) other objects. Take a look at Figure 6. The drawing on the right contains many objects that are neatly trimmed by the outline of the triangle. Notice that the circle (which is selected) actually extends past the boundary of the triangle—but only the portion within the triangle is displayed or printed, because the triangular mask hides the remainder of the circle.

Masks are useful because they allow you to create a common boundary for multiple elements. In Figure 6, the same mask trims the circular sun, all of the rays, a red rectangle, and the blue free-form cloud. You can use masks—which can be regular geometric shapes or totally free-form—to crop vector objects created within Illustrator or bitmapped pictures imported from external sources.

At first glance, masking in Illustrator seems pretty simple. You select the object to use as a clipping path, open the Paint Style dialog box (either by double-clicking the object with the right mouse button or using the Paint menu), give the object a fill of None, assign whatever line style you think appropriate, and turn on masking by clicking the Mask option box—but the mask won't work unless you've properly prepared your drawing.

The following checklist should help you examine your drawing and determine why a mask isn't working.

- The mask outline must be a true path. If you created the mask using one of Illustrator's geometric primitives (a rectangle or an oval, for instance), you must use the Ungroup command to convert the object into a path composed of free-form lines and curves.

- A mask may not contain a center anchor point. Even if you have ungrouped and edited a rectangle or an oval, you must delete the center point manually. Figure 6 shows a triangle, which I created from a rectangle. As you can see, even though I ungrouped the rectangle and edited the object (by removing one of the sides to form a triangle), a center point remains. The center point, which appears as a small x, is still part of the object. To remove it I switched into wireframe (Art-

work Only) mode, the only mode in which you can see center anchor points. Then I used the Direct-selection tool (the hollow arrow) to highlight the anchor point and delete it.

- A mask will only work if the path is closed, meaning that the starting and ending points of the path have been joined together. If you create the mask outline using either the freehand or pen tools, double check to be sure that the object is closed. If the path is open, select both the starting and ending points, then use the Average and Join commands on the Arrange menu to create coincident points and to connect them.

- A mask can't be a grouped object. If you need to use multiple outlines for your mask, combine them with the Make Compound command (on the Paint menu). Creating a compound path is an especially important technique if you want to use multiple letters as a mask. Remember that a mask must be a path, not an object, so first you'll have to convert the text to a free-form shape using the Create Outlines command from the Type menu. Next, select all of the letters you want and turn them into a compound path.

- The mask outline must reside on the backmost layer of your drawing. Unfortunately, Illustrator offers minimal layering functions, so it's often difficult to know if you've truly sent the mask outline to the back of the stack. In order to ensure that it is behind all other objects in your drawing, first select the mask and use the Edit menu to cut it from the drawing, then use the Paste In Back command to position it on the bottom of the stacking order.

- By default, a mask outline will crop everything on the drawing page—including elements that you may not want masked. To apply the masking effect to selected objects, group them together with the mask. This releases all other objects in your drawing from the masking effect.

This checklist may seem intimidating at first, but if you can master the basic concepts outlined here—paths, compound paths, grouped objects, and stacking order—you'll be able to create masking effects consistently within Adobe Illustrator.—*Luisa Simone*

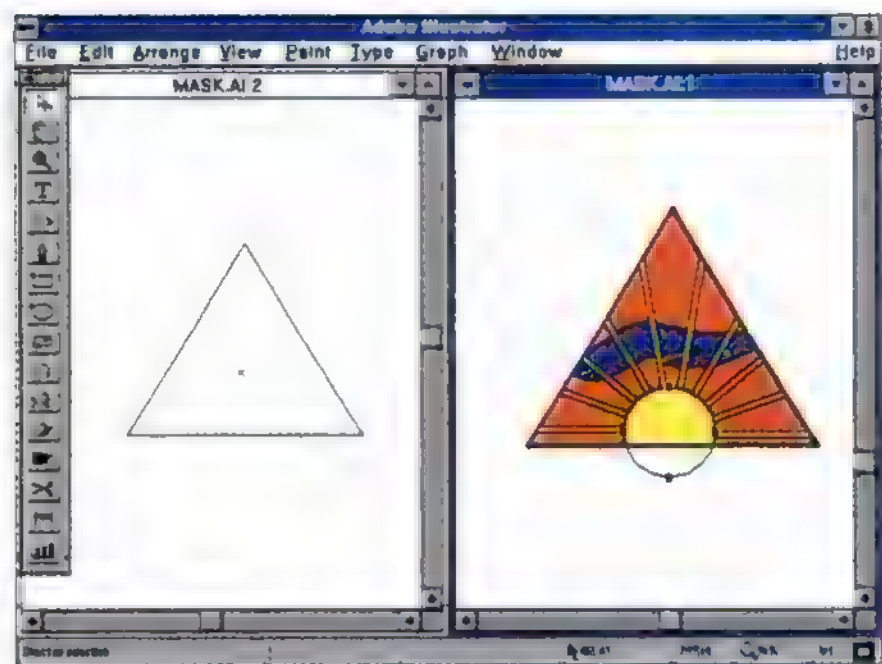


Figure 6: The vector outline (shown on the left) can be used as a mask. Notice how all the objects in the right window are trimmed to fit into the triangle shape.

It pays to compare.

EPS VESA Or ISA Bus

YOUR CHOICE

- ▶ INTEL 486 Processor, 256K Cache On Board (Your Option: 486SX-33MHz, 486DX-33MHz, DX2-50MHz and DX2-66MHz)
- ▶ 4 MB High Speed RAM
- ▶ Both TEAC 1.2 MB & 1.44 MB Floppy Disk Drives
- ▶ Maxtor 130 MB IDE Hard Drive (15ms)
- ▶ EPS 1 MB 24 Bit SVGA 16.7 Million Color Card (w/accelerated WINDOWS Drivers)
- ▶ EPS 14" 1024 x 768 Non-Interlaced SVGA Monitor .28 Dot Pitch
- ▶ 101 Enhanced Keyboard
- ▶ Desktop Case w/6 Drive Bays
- ▶ MS WINDOWS 3.1 w/Documentation
- ▶ MS DOS 6.0 w/Documentation
- ▶ MS Compatible 3-Button DPI Mouse
- ▶ System User Manual
- ▶ 60-Day Money-Back Guarantee
- ▶ 3-Year Superior Warranty
- ▶ 1-Year On-Site Service, Extension Available
- ▶ Customizing Available

EPS 486SX-33 **\$1495**
Intel 33 Standard 128K Cache

EPS 486DX-33 **\$1695**

EPS 486DX2-50 **\$1845**

EPS 486DX2-66 **\$1945**

EPS VESA Local Bus

CORP. FAVORITES

- ▶ INTEL 486 Processor, 256K Cache On Board (Your Option: 486SX-33MHz, 486DX-33MHz, DX2-50MHz and DX2-66MHz)
- ▶ 8 MB High Speed RAM
- ▶ 3-32 bit "True VESA Bus Mastering," 3-16, 1-8 bit Slots
- ▶ Both TEAC 1.2 & 1.44 Floppy Disk Drives
- ▶ Maxtor 245 MB IDE Hard Drive (15ms)
- ▶ Local Bus Hi-Speed IDE Controller (Supersonic 14+ MB Per Second Throughput)
- ▶ EPS "Warp Speed" VESA Local Bus Card 1 MB VRAM w/Weltek P9000 Chip (Optional 2 MB VRAM)
- ▶ Fastest VESA Video In The Industry
- ▶ EPS 15" Digital SVGA Monitor 1280 x 1024 w/ Push Button Ease & Low Radiation
- ▶ 101 Enhanced Keyboard
- ▶ Desktop Case w/6 Drive Bays
- ▶ MS WINDOWS 3.1 w/Documentation
- ▶ MS DOS 6.0 w/Documentation
- ▶ MS Compatible 3-Button Mouse
- ▶ System User Manual
- ▶ 60-Day Money-Back Guarantee
- ▶ 3-Year Superior Warranty
- ▶ 1-Year On-Site Service, Extension Available
- ▶ Customizing Available

EPS 486SX-33 **\$2045**
Intel 33 Standard 128K Cache

EPS 486DX-33 **\$2195**

EPS 486DX2-50 **\$2345**

EPS 486DX2-66 **\$2495**

EPS also offers a full line of hard drives, CD-ROMS, tape backups, etc. If the above configurations don't meet your requirements, call your EPS sales consultant today with your specifications or FAX them directly to 1-605-966-5462

EPS Technologies

a tradition of value and performance

1-800-447-0921
ORDER TODAY TOLL FREE

CIRCLE 197 ON READER SERVICE CARD

GSA Contract #GSOOK91AGS035-PS02

FAX Orders 1-605-966-5462 • Direct Line 1-605-966-5906 • Tech Hot Line 1-800-426-4296 EPS Technologies, Inc. 10869 Dakota Avenue P.O. Box 278 Jefferson, SD 57034 Hours: Mon-Fri 9-5:30pm Sat 9-12:30pm

All brands and product names, trademarks and logos are the property of their respective holders. Prices are subject to change without notice. EPS is a trademark of EPS Technologies.

"Killer CAD Machine!"

Visit Tri-Star at AUTODESK EXPO Booth 747

PC SOURCES 12/92

INTEL 486 PROCESSOR
8MB RAM
128K WRITE-BACK CACHE
TRUE 32-BIT VL-BUS IDE CONTROLLER
PUMA-VL WINDOWS ACCELERATOR
WITH 2MB RAM
17" FLAT SQUARE EDGE TO EDGE
SVGA MONITOR
250MB 13ms IDE HARD DRIVE
TEAC 1.2MB & 1.44MB FLOPPY
DRIVES
MICROSOFT WINDOWS 3.1 &
DOS 6.0
TOWER CHASSIS WITH
DUAL COOLING FANS
101-KEYBOARD

66MHz DX2

\$2855

Lease \$109/Month

66MHz DX2
WITH DUAL REMOVABLE 250MB
HARD DRIVES

\$3255

Lease \$117/Month



INTEL 486 PROCESSOR
8MB RAM
128K WRITE-BACK CACHE
VL-BUS IDE CACHE CONTROLLER WITH 2MB RAM
PUMA-VL WINDOWS ACCELERATOR
WITH 2MB RAM
17" FLAT SQUARE EDGE TO EDGE
SVGA MONITOR
340MB 13ms IDE HARD DRIVE
TEAC 1.2MB & 1.44MB FLOPPY
DRIVES
MICROSOFT WINDOWS 3.1 &
DOS 6.0
TOWER CHASSIS WITH
DUAL COOLING FANS
101-KEYBOARD

66MHz DX2

\$3255

Lease \$117/Month

66MHz DX2
WITH DUAL REMOVABLE 340MB
HARD DRIVES

\$3755

Lease \$134/Month

For over five years Tri-Star has been satisfying the appetites of the most demanding power-hungry CAD professionals. So far in 1993 alone our computers have won two Editor's Pick awards from *Windows Sources* and a Best Buy award from *PC World*. In a review against Compaq, AST and Gateway, *PC Week* called Tri-CAD, "...the best value of the systems that cost more than \$4000." Tri-Star now ranks among the industry's best in *PC Magazine's* annual survey of service and reliability.

VIDEO UPGRADES

VL-BUS ACCELERATOR/2MB VRAM

\$255

20" BIG SCREEN DISPLAY

\$595

Tri-Star's new enhanced mass storage subsystems include a VL-Bus IDE Cache Controller expandable to 16MB providing data transfer rates over ten times faster than the competition. Dual Removable 340MB Hard Drives offer you the option of configuring one 680MB volume or two mirror imaged 340MB volumes. With dual removable 1" hard drives fault tolerance and security are optimized.



16MB RAM UPGRADE

\$295

20" MPR-II BIG SCREEN DISPLAY

\$995

21" MPR-II FLAT SCREEN DISPLAY

\$1495

Add our most popular Auto-CAD productivity bundle...including the Tri-CAD 12" x 12" digitizer with cordless 16-button cursor along with Vibrant Soft Engine, Cyco Drawing Manager and Tri-CAD CBT software. \$369



TRI-STAR
COMPUTER CORPORATION
1 800 755 1000

120 South Weber Drive, Chandler, Arizona 85226

(602) 961-3401 Fax (602) 961-4010

CIRCLE 121 ON READER SERVICE CARD

Intel Inside logo is a trademark of Intel Corporation.
Two Year Parts Warranty
Lifetime Labor Warranty
30-Day Money Back Guarantee
Toll-Free Technical Support
24-Hour 885 Service
One Year On-Site Service
One Year Overnight Parts Replacement

Networking

QUICKER NETWORK PRINTING

TIP Your November 24, 1992, column carried a tale of woe from a NetWare user who sent large print jobs to a LAN-based laser printer. Large jobs print very slowly on a network because the server collects the entire print job from the application before sending the first page to the printer. But I've found a trick that speeds things up: Just print the document a few pages at a time.

Our office regularly prints manuals of 300 or more pages from WordPerfect to a PostScript printer. If we print the entire manual at once, it can be 20 minutes before the first page comes out of the printer. The response is much quicker if we send only 30 to 50 pages at a time. Since the LAN considers each set of pages to be a separate print job, it prints the first set while spooling the second. This cuts our total print time in half or better, and provides the opportunity for proofreading the first pages of the document while the later pages are being spooled and printed. If we find an error that affects page breaks and numbering, we can cancel printing of the remaining pages and save paper.

This method also gives users with short 2- or 3-page documents a chance to have their jobs printed from the queue in between sections of the behemoth. It works well with Windows software such as PageMaker or Word for Windows.

You'll probably want to have your NetWare CAPTURE command include a Banner page with the name of the user, so that—in the pile of papers at the printer—you can easily tell where print jobs start and stop.

*Tony Krebs
Seattle, Washington*

►PC MAGAZINE: This is the kind of simple solution that makes you say, "Now why didn't I think of that?" Just don't forget that you'll also want to insert NA (No Autoendcap) into the client PC's CAPTURE command, so that the print server doesn't wait for the application to terminate before releasing the job.

—Frank J. Derfler, Jr.

MICROWAVE INTERFERENCE

Every day at 5:00 P.M. our 10BaseT network slows to a crawl, and a network analyzer shows a slew of retry messages and Ethernet frame fragments. Our company is located directly above a bank, and we've discovered that the vault alarm—a microwave detection system—is turned on at exactly 5:00 P.M. Our networking equipment is of very good quality, but it seems that the microwave signals are swamping the Ethernet signals. The problem isn't isolated to one or two nodes; it starts as soon as the wires from any two nodes are connected to the wiring hub. Do you think there is anything we can do about this?

*Sam Raney
Atlanta, Georgia*

►PC MAGAZINE: Here's something that might solve your problem. In Europe, particularly in Germany, vendors install 10BaseT using a 100-ohm shielded twisted-pair cable. This cable is different from the shielded twisted-pair cable used in Token-Ring networks, which has an impedance of 150 ohms and a much larger outside diameter. The 100-ohm shielded twisted-pair cable isn't much larger than the standard 100-ohm unshielded twisted-pair used for 10BaseT, but it has one layer of shielding around the entire cable. This shielding should easily block the microwave radiation from the bank's alarm system.

The only installation problem you'll face is how to properly ground the shield on the cable. If it isn't grounded at one end, typically the end at the wiring closet or hub, then the shield becomes an antenna and your problems will quickly multiply.

Mod-Tap (508-772-4884) sells the 100-ohm shielded cable and also markets a patch panel that can grasp the cable shield and ground it. You can terminate all of the 100-ohm shielded twisted-pair cables in the patch panel and retain the wiring hub and LAN adapters you've already installed. You'll need a good ground connection for the patch panel. The 100-ohm shielded twisted-pair cable offers more protection from interference than unshielded twisted-pair, while maintaining compatibility with 10BaseT

wiring hubs and avoiding the conduit-crowding problems that are associated with Token-Ring shielded twisted-pair wire.—Frank J. Derfler, Jr.

Languages

READING AND SETTING FILE ATTRIBUTES IN BASIC

We would like to know how to locate a file and modify its attributes from programs written in QuickBASIC. We have no problem creating files, but cannot find a way to set their attributes using BASIC commands.

*Daniel and Derek Soder
Sulphur Springs, Texas*

►PC MAGAZINE: Locating files and changing their attributes are two different things. QuickBASIC offers no direct way to read names of files from a directory, although the newer BASIC PDS and Visual Basic for DOS versions do. Reading filenames in a QuickBASIC program requires the CALL INTERRUPT command; with all versions of BASIC, CALL INTERRUPT is needed to read and set file attributes, because there are no built-in commands that do this.

The QBIDOS.BAS file that is shown in Figure 7 includes three functions that QuickBASIC programmers will find useful. QBDIR\$ is modeled after the DIR\$ command available in BASIC PDS and Visual Basic. GetAttr and SetAttr read and assign new file attributes, respectively, and they will be useful to all BASIC programmers. To use these functions, you should remove the demonstration portion of the program, as indicated by the comments included in the file. Then load the QBIDOS.BAS file as a module in the BASIC editor using the File..Load pull-down menu command. If you are using BASIC PDS or VB/DOS, you will not need the QBDIR\$ function. To delete it, just press the F2 key to show all the functions in the module, and then highlight QBDIR\$ and select the Delete option.

When QBDIR\$ is invoked with a file specification such as "*.DOC", it returns

"LIGHTWEIGHT" PRICES ON "LIGHTWEIGHT"

10 lbs. of IBM® Value in a 5 lb. Notebook

DIRECT CHANNEL EXCLUSIVE! from **USA★FLEX**

**2400/9600
Internal
Data/Fax
Modem
Included!**

IBM® PS/note™

Intel 386SL-25MHz,
85MB Hard Drive
with Data/Fax Modem,
Prodigy, WinFax LITE and
Promenade

Address
Book Plus

PRODIGY

PROMENADE

WinFax
USER'S GUIDE

COMPLETE

**PS/note-Everything
Shown Above Plus More!**

\$1499

PSNOTE

- Light Weight-only 5.2 lbs with battery!
- Small Size-8.3" D x 11.7" W x 1.9" H
- Powerful, Intel 386SL-25MHz with energy saving features
- 2MB memory, expands to 10MB
- 3.5" 1.44MB internal diskette drive
- 85 MB 18ms hard disk
- 2400/9600 internal data/fax modem with S/W
- Large 10" backlit VGA display-with 64 shades of gray
- 85 key keyboard with full size keys, inverted "T" cursor
- Genuine LogiTech Trackman portable mouse
- NiCd batteries, 4+ hours use, plus 1-hour quick recharging
- Custom-designed carrying case at no additional charge
- 1 year IBM international limited warranty with 48 hour Express Maintenance

FREE PRELOADED SOFTWARE

- IBM PC DOS 5.0
- Windows 3.1
- WinFax LITE-Makes faxing quick and easy
- PRODIGY*-Intro to online weather, stock quotes & more
- Promenade**-Intro to online encyclopedia, business center, special interest clubs & more
- Address Book Plus-Print labels, envelopes...place calls
- PS/note Tutorial-Helps you get started using Windows
- PS/note Index-Helps you get the most from your PS/note
- PS/note Fitness-Virus check

**MADE
IN THE
U.S.A.**

TO ORDER, CALL...

USA★FLEX

CODE # PM06A3 471 Brighton Drive, Bloomington, IL 60103

1-800-766-1940



**OPEN
24 HOURS**
MONDAY
THRU
FRIDAY
9 AM TO 4 PM

*PRODIGY service is provided at no additional cost for three months. Phone charges may apply. **Promenade is provided at no additional cost for five hours. Phone charges may apply. IBM is a registered trademark and PS/note is a trademark of International Business Machines Corporation. PRODIGY service is a trademark of Prodigy Services Company. Intel, Intel Inside are trademarks of the Intel Corporation. Price and specifications are subject to change without notice. Shipping and handling charges additional.

NOTEBOOKS FROM USA★FLEX

TOSHIBA

Satellite T-1850

80MB Hard Drive

- i386SX, 25MHz
- LCD Display
- 4MB Memory, Exp. to 12MB
- 82 Key Keyboard
- 3.5" Floppy Disk Drive
- NiCd Battery for 3+ hrs.
- 6.8 lbs

\$1289

PC1033U-0A

120MB
Hard Drive
\$1459
PC1034U-0A



Included
on all
Toshiba
Models

- ★ MICROSOFT DOS 5.0
 - ★ LIGHT-WEIGHT AC ADAPTER
 - ★ TOSHIBA'S EXCLUSIVE
 - Exceptional Care™ Program
- Ask for details

T-1850C Color Notebook 80MB Hard Drive, Windows 3.1 and Trackball

PC1033U-X1A **\$1879**

1992
PC Magazine Award
for Technical Excellence

PORTABLES
TOSHIBA T4400XC
Toshiba America
Information Systems, Inc.

T4400XC
PC Magazine Award
for Technical Excellence

PC
MAGAZINE
EDITOR'S
CHOICE

August 1992
Toshiba T4400XC

T-4400C

120 MB Drive **\$3389**

200 MB Drive **\$3899**

- i486 Processor
- 25MHz
- Color Display
- 4MB Memory
- 4-way 8K Cache
- 3.5" Floppy Disk Drive

T-4500/T-4500C

T4500 Performance Notebook

- i486SX, 20MHz
- LCD Display
- 4MB Memory
- 4-way 8K Cache
- 82 Key Keyboard
- 3.5" Floppy Disk Drive
- NiCd Battery for 3+ hrs.
- 6.4 lbs

80 MB Drive **\$2079**

T4500C Performance Notebook

- i486SX, 20MHz/3.3 Volt
- COLOR Display
- 120 MB Hard Drive
- 4MB Memory
- 4-way 8K Cache
- 82 Key Keyboard
- 3.5" Floppy Disk Drive
- NiMH Battery for 2.5 hrs.
- 6.8 lbs

120 MB Drive **\$2199**

\$3219

TOSHIBA T4500 Series
Includes 16mm PCMCIA Type IV slot

All T4500 Models
include Windows 3.1,
& Direct Connect
Trackball Mouse!

TOSHIBA NOTEBOOKS AND LAPTOPS	DISPLAY	PROCESSOR	CLOCK SPEED (MHz)	HARD DRIVE (MB)	STANDARD MEMORY/ MAX. MEMORY	CACHE MEMORY	KEY- BOARD (KEYS)	BATTERY	BATTERY LIFE (HOURS)	STANDARD EXPANSION SLOTS	EXPANSION SLOTS	W/BATTERY (LBS.)	USA FLEX PART NUMBER	FLEX PRICE	MEMORITZ 3400PS W/1000PS 1.7V FAX MODEM
T1850	LCD	i386SX	25	80	4MB/12MB	-	82	NiCd	3+	1 VGA MONITOR, 1 SELECTABLE (PAR., TAPE DRIVE, OR 8.25" DRIVE), 1 SERIAL, 1 KEYBOARD/PAD		6.8	PC1033U-0A	\$1289	DI-T324FM \$209
T1850	LCD	i386SX	25	120	4MB/12MB	-	82	NiCd	3+		1 MODEM, 1 MEMORY	6.8	PC1034U-0A	\$1459	DI-T324FM \$209
*T1850C	COLOR	i386SX	25	80	4MB/12MB	-	82	NiCd	2+			7.3	PC1033U-X1A	\$1879	DI-T324FM \$209
*T1850C	COLOR	i386SX	25	120	4MB/12MB	-	82	NiCd	2+			7.3	PC1034U-X1A	\$1999	DI-T324FM \$209
**T4400C	COLOR	i486SX	25	120	4MB/20MB	8K	82	NiCd	3		1 MODEM, 1 MEMORY	7.25	PC24-PA1183UT	\$3389	DI-T324FM \$209
T4400C	COLOR	i486DX	25	200	4MB/30MB	8K	82	NiCd	3	1 VGA MONITOR 1 SELECTABLE (PAR., TAPE DRIVE, OR 8.25" DRIVE), 1 SERIAL, 1 EXP. BUS, 1 PS/2 KEYBOARD, 1 PS/2 MOUSE		7.25	PC24-PA1158UT	\$3899	DI-T324FM \$209
*T4500	LCD	i486SX	20	80	4MB/20MB	8K	82	NiCd	3+		1.18mm PCMCIA, 2 MEMORY, 1 EXP. BUS	6.4	PC1107U-M2A	\$2079	DI-CC324FM \$299
*T4500	LCD	i486SX	30	120	4MB/20MB	8K	82	NiCd	3+			6.4	PC1108U-M2A	\$2199	DI-CC324FM \$299
*T4500C	COLOR	i486SX	20	120	4MB/20MB	8K	82	NiMH	2.5			6.8	PC1108U-X2A	\$3219	DI-CC324FM \$299
T6400	PLASMA	i486DX2	60	200	4MB/36MB	8K	101				1 MODEM, 2 MEMORY, 1.18 BIT ISA EXP.	11.7	PC25-PA1604U	\$3589	DI-T324FM \$209
T6400C	COLOR	i486DX2	60	200	4MB/36MB	8K	101					12.9	PC25-PA1604UX	\$5499	DI-T324FM \$209

*Comes with Win 3.1 and clip-on trackball mouse. **Can be upgraded to a i486DX-25MHz

NEW From USA Flex!

Software Support Package

Here's what you get...

- Toll-free software support for 1 yr
- 24 hours a day, 7 days a week
- Over 1,000 IBM compatible programs supported
- Instant and expert response

Plus Special Bonus...
Free 1 Hour Training Video on
"How to Use Windows 3.1"

Only... \$59
with purchase of any
TOSHIBA or IBM system
shown here.

Accessories for your Toshiba Notebook & Laptop Systems

MHz Modems

External Pocket Modem
2400 bps with S/R Fax/DI-P224FM **\$189**

2400 bps with 9600 bps Send/Receive Fax
T1800, T4400C, T6400 series DI-T324FM **\$209**

T3300SL, T4500 series DI-CC324FM **\$299**

9600 bps with 9600 bps Send/Receive Fax
T1800, T4400C, T6400 series DI-T396FM **\$529**

14,400 bps with 14,400 bps Send/Receive Fax
For Models T3300SL, T4500, T4500C DI-CC3144 **\$529**

T1800, T4400C, T6400 series DI-T3144 **\$339**

TARGUS

Carrying Case

Notebook Nylon Case
14" X 11" X 2.5" TAR-NPAC **\$39**

Laptop 5 Deluxe Nylon Case
15.5" X 13" X 3.5" TAR-LAPP5 **\$59**

Universal Notebook Case
12.5" X 13" X 2.5" TAR-UNNOTE **\$79**

Leather Case
15" X 11" X 2.5" TAR-LEATHN1 **\$99**

Government & Education Sales 1-800-395-7025
Government & Education FAX (708) 351-9871

Habla Espanol 1-800-723-5500 • (708) 924-6780

Pour les Francophones 1-800-723-2256 • (708) 582-5179

Verhandlungen in deutsch (708) 924-6680
(7:00 Uhr bis 15:00 Uhr)(Midnight to 9:00 a.m. cst)

FLEXFAX Automated Fax Retrieval System

- Details/specs on products
- Technical support/helpful Hints
- Monthly Specials
- "Like new" demo stock
- Inventory clearance items

FLEXFAX
(708) 351-5419

CIRCLE 065 ON READER SERVICE CARD

All products or services are identified by the trademarks or service marks of their respective companies. Specific software documentation may differ from that illustrated. All prices and specifications are subject to change without notice. Shipping and handling charges additional. 30 day money back guarantee applies to Flex systems only (does not include printers or other non-installed peripherals. Downloaded and opened software is not refundable. * Monthly payment based on 36 month open end business lease. The Intel Logo and OverDrive are registered trademarks of Intel Corporation.

Code # PM06A3

FLEX Premium 486 VESA Local Bus Systems

FLEX VESA Local Bus Blazing Speed, Great Price!

By creating a high speed 32-bit wide path running at the system's clock speed, the bus throughput performance of our FLEX VESA Local Bus System is improved almost 400% versus a comparable EISA system and over 1000% compared to a similarly configured ISA system. Frustrating "traffic jams" that slow down video and hard drive performance are a thing of the past.

"Switch Selectable" Clock Frequencies for easy upgrades (no "crystal" needed)

Two VESA Local Bus Slots Capable of Bus Mastering and Direct Memory Access.

238-pin OverDrive™ Ready ZIF Socket for easy upgrades

- **Whisper Quiet Floppy Drives from Sony and TEAC**
...for unbeatable quality and reliability.
- **Keyboard from IBM by Lexmark**
...we wouldn't think of skimping on the keyboard.
- **FlexVision 14" MultiScan TRUE COLOR Monitor**
...sharp, flicker-free images at even the highest resolutions.
- **VESA Local Bus Accelerator Card by Boca**
...supports up to 16.7 million colors.
- **Desktop Case Designed For High Speed 486**
...meticulous design plus 7 drive bays.
- **Hard Drive from Western Digital**
...170MB of peak performance.
- **Genuine Microsoft Mouse**
...nothing but the best, right down to the mouse.



All FLEX Premium Computer Systems Include:

- Microsoft DOS, Microsoft Windows and Mouse
- 30 Day "NO RISK" Money Back Guarantee
- One Year Parts and Labor Warranty
- 24 Hour Toll-Free Technical Support, 7 DAYS A WEEK!
- Overnight Parts Replacement via Federal Express
- On-Site Service Should an Unusual Problem Occur (On Computer Only)
- Bulletin Board Technical Support



✓ All FLEX VESA Local Bus Systems Come With:

- 128K Ultra-fast "Writeback" Cache Memory
- Upgradeable to all Intel OverDrive™ Processors Including Pentium-Based "P24T"
- 170 MB < 13ms Hard Disk Drive with Built-in 32K Cache
- VESA 32-Bit Local Bus IDE Controller
- 4 MB RAM Expandable to 32 MB
- Super VGA 1024 X 768 FLEXVISION 14" .28 mm Non-Interlaced Monitor by MAG Innovation
- 32-Bit VESA Local Bus Video Accelerator Card with 16.7 Million "True Color" Capability, 1MB Video Memory, 1280 x 1024i Maximum Resolution
- 1.44 MB and 1.2 MB Floppy Disk Drives
- 101 Key "Space Saving" Keyboard
- 2 Serial and 1 Parallel Port
- Highest Quality Desktop Cabinet with Full 200 Watt Power Supply
- MS-DOS, Windows 3.1 and Mouse

✓ Choose Your Speed!

FLEX VL486SX 25MHz VESA Local BUS

Intel486™ SX 25MHz Microprocessor
with 170 MB Hard Drive

\$1499

Business Leases from '57/Month*

FLEX VL486DX 33MHz VESA Local BUS

Intel486 DX 33MHz Microprocessor
with 170 MB Hard Drive

\$1699

Business Leases from '64/Month*

FLEX VL486DX2 50MHz VESA Local BUS

Intel486 DX2 50MHz Microprocessor
with 170 MB Hard Drive

\$1849

Business Leases from '69/Month*

FLEX VL486DX2 66MHz VESA Local BUS

Intel486 DX2 66MHz Microprocessor
with 170 MB Hard Drive

\$1999

Business Leases from '75/Month*

210MB and 340MB Hard Drives Available. Call for Pricing!

TO ORDER, CALL...

USA FLEX

1-800-333-4515



OPEN 24 HOURS
MONDAY
THRU
FRIDAY
9 AM to 6 PM
SAT & SUN
10 AM to 4 PM

From **USA** **FLEX!**

USA FLEX **Redefines Service and Support!**

Introducing
**Two New Flex Advantages
Included With Every
FLEX Premium VESA Local Bus System....**

FREE! **Software Support!**

- TOLL-FREE Software Support
- 24-Hours a Day, 7 Days a Week
- 1 FULL Year
- Support For Over 1,000 IBM® Compatible Programs

**PLUS! Free One Hour
Training Video on
"How To Use Windows 3.1"**

Ask your Sales Representative for details.

FLEX Software Support Package also available with
FLEX ValueLine Systems for only \$59.



FLEX ValueLine MultiMedia System

MultiMedia Made Easy
for only... **\$1499**

- FLEX "Windows Ready" ValueLine System w/105MB HD, 4MB RAM, Windows 3.1 and Microsoft Mouse
- Internal CD ROM Drive
- 375ms access, 16 bit controller
- Sound Galaxy Nx II
- PLUS Graphics Works™ LE from MICROGRAFX® and Compton's Sampler (20 Titles)



Ask about our
Educational or
Entertainment
CD Bundles



Government & Education Sales 1-800-395-7025
Government & Education FAX (708) 351-9871

Hable Espanol 1-800-723-5500 • (708) 924-6780

Pour les Francophones 1-800-723-2256 • (708) 582-6179

Verhandlungen in deutsch (708) 924-6680
(7:00 Uhr bis 15:00 Uhr)(Midnight to 9:00 a.m. cst)

FLEXFAX Automated Fax Retrieval System



FLEXFAX
(708) 351-5419

- Details/specs on products
- Technical support/helpful Hints
- Monthly Specials
- "Like new" demo stock
- Inventory clearance items

The **FLEX Advanta** Workstation Maximum IBM® Compatibility Plus 486SLC2 50MHz Speed!

Motherboard, Processor, and BIOS by IBM

At the heart of the FLEX *Advanta* Workstation is a unique motherboard manufactured by IBM and using the Intel licensed 486SLC2 50MHz processor. By incorporating larger 4-way, 16K Cache and clock-doubling technology. The FLEX *Advanta* Workstation provides high performance and speed at an unbelievably low cost.



WinMarks Video Performance



Paradise Windows Accelerated Video

The Flex *Advanta* System features high performance video capable of 1280 x 1024i, 256 colors in 1024 x 768 and 1MB of display RAM.

The FLEX Advanta System 486SLC2 50MHz

- 486SLC2 50MHz Microprocessor, 4-way 16K Internal Cache
- 170 MB < 16ms IDE Hard Drive
- 4 MB RAM up to 32 MB
- 14" SVGA FLEXVISION True Color Multi-Scan Monitor, .28mm dot pitch, 1024 x 768 Non-Interlaced Resolution
- Paradise WD90C31 Windows Accelerator Video, 1 MB RAM
- 3.5" 1.44 MB Floppy Disk Drive
- Easy, Low Cost Math Coprocessor Upgrade
- 101 Key Keyboard
- 2 Serial and 1 Parallel Port
- MS-DOS 6 and MS-Windows 3.1
- Genuine Microsoft Mouse
- Free Software Support, 24 Hours a Day, 7 Days a Week

Optional Accessories Include: CD-ROM, Tape Back-Up, Network Cards, and MORE! Ask your USA FLEX sales representative for the details.

For Only...

\$1499

FLEX ValueLine Starter System 486SX-25MHz

For Only...
\$999



- Upgradeable 486SX-25MHz Processor
- 80MB IDE Hard Disk Drive
- 2 MB RAM, Expandable to 32 MB
- SVGA Card with 1024 x 768 Max. Res.
- 14" SVGA Color Monitor, 1024 x 768i Max. Res.
- 1.44 MB Floppy Disk Drive
- 101 Key Keyboard
- Three 5.25" Drive Bays
- Space Saving Mid-Tower Case, 200 Watt Power Supply
- MS-DOS 6



FLEX "Windows Ready" ValueLine System same as Starter System only upgraded to 4MB RAM, 105MB HD, True Color Video Card w/1MB RAM and 16.7M Colors
\$1099

All products or services are identified by the trademarks or service marks of their respective companies. Specific software documentation may differ from that illustrated. All prices and specifications are subject to change without notice. Shipping and handling charges additional. 30 day money back guarantee applies to Flex systems only (does not include printers or other non-installed peripherals). Downloaded and opened software is not refundable. * Monthly payment based on 36 month open end business lease. The Intel Logo and OverDrive are registered trademarks of Intel Corporation.

Code # PM06A3

Monitors

SAMSUNG	
14" CVL4955 .41mm, 640 X 480	*219
14" SM 2 .39mm, 1024 X 768 Int.	*249
14" SM 3 .28mm, 1024 X 768 Int.	*299
14" SM 3n .28mm, 1024 X 768 NI	*339
15" SM 15c .28mm, 1024 X 768 NI	*489
17" SM 4 PLUS .31mm, 1024 X 768 NI	*779
17" SM 5c .26mm, 1280 X 1024	*899

MAG	MAG INNOVISION
14" 1448 .28mm, 1024 X 768 NI	*309
15" MX15F .28mm, 1280 X 1024 NI	*579
15" MX17F .26mm, 1280 X 1024 NI	*1049

CTX	
14" 5439-A .39mm, 1024 X 768 Int.	*249
14" 5468 .28mm, 1024 X 768 Int.	*289
14" 1461 .28mm, 1024 X 768 NI	*315
15" CPS 1561 .28mm, 1024 X 768 NI	*399
15" CPS 1560* .28mm, 1024 X 768 NI	*459
17" 1760 Proscan* .28mm, 1280 X 1024 NI	*829

*Microprocessor based

SONY	
14" CPD-1320 .25mm, 640 X 480	*339
14" CPD-1430 .25mm, 1024 X 768 NI	*599
17" CPD-1604S .25mm, 1024X768 NI	*1049

NEC	
14" 2A .31mm, 800 X 600	*349
NEW 15" 3FGc .28mm, 1024 X 768 NI	*599
15" 3FGx* .28mm, 1024 X 768 NI	*609
NEW 15" 4FGc .28mm, 1024 X 768 NI	*719
NEW 17" 5FGc .28mm, 1280 X 1024 NI	*1099
17" 5FG* .28mm, 1280 X 1024 NI	*1249
21" 6FG* .28mm, 1280 X 1024 NI	*2299
27" 3PG Monitor/TV Res. to 800x600	*2899

SPECIAL SAVINGS ON NEC MONITORS

SPECIAL NEC "CLOSE OUT" PRICE!

2 Year Limited Warranty	
"Brand New" NEC 14" 3D Monitor	*399
NEC "OEM" MONITOR SALE!	
1 Year Warranty	
NEC 17" 5 FG Monitor*	*1129
NEC 21" 6 FG Monitor*	*1999

*NEC monitors with AccuColor Control

New Amazing Monitors	
12" Mono TTL Amber	*75
14" Mono VGA Wht.	*115
14" SVGA Color .28mm 1024 x 768 Int.	*275
14" SVGA Color .28mm 1024 x 768 NI	*315
15" SVGA Color .28mm 1024 x 768 NI	*435

BackPack Ext. Drives

MicroSolutions	
Plug 'N Play - No Slot Drives	
Floppy Drive require DOS 2.0 or above	
3.5" or 5.25"	*189
Tape Drive require DOS 3.0 or above	
80/250 MB w/Data Comp.	*389
Hard Drive requires DOS 3.0 or above	
40 MB *409 / 100 MB *499 / 200 MB *629	
CD-ROM Multi-Session Drive Req. DOS 3.1 or above.	
350ms, front-loading CD-ROM, 128 KB cache,	
150 KB trans. rate	*359

Hard Drives

3.5" IDE DRIVES	Seagate
ST351A/X - 42/80 MB*, 28ms	*119
ST3120A - 102 MB, <16ms	*199
ST3144A - 130 MB, 16ms	*219
ST3283A - 245 MB, 12ms	*319
ST550A - 425.4 MB, 12ms	*589
5.25" SCSI DRIVES	
ST3283N - 248 MB, 12ms	*349
ST3600N - 525 MB, 12Wms	*919
ST41200N - 1GB, 15ms	*1049
ST42400N - 2.1GB, 11ms	*2129
Cable and frame kit sold separately.	
*80MB w/ AddStor data compression software.	

USA FLEX... FOR SOLUTIONS THAT

Modems

FLEX ultimate
14,400/14,400,
V.32bis Internal Modem
 14,400 bps data, 14,400 bps
 S/R fax. V.32, V.32bis, V.42,
 V.42bis, MNP5 protocols,
 throughput to 57600 bps,
 Quicklink software.
DI-UL14FX

\$179

FREE
Software
Quick Link II
FastFax

NEW ACCURA™	
MODEM LINE FROM HAYES	
ACCURA 2400	Int. 125432 *85
	Ext. 125434 *75
ACCURA 96 + FAX96	Int. 125438 *209
	Ext. 125439 *229
ACCURA 144 + FAX144	Int. 245802 *239
	Ext. 245803 *259
OPTIMA™ 24/SC EZ	125488 *125
OPTIMA 24 + FAX96	125475 *139
OPTIMA 96 + FAX96	125479 *379
OPTIMA 144+ FAX144	125478 *389
POCKET EDITION™ 2400	125450 *119

PRACTICAL PERIPHERALS.	
2400/9600 Pocket FAX	PM2400FPM *109
2400/9600 Data/FAX ...	INT PM2400EFX *89
	Ext. PM2400EFXA *109
9600/9600 V.32	INT PM9600FX *179
	Ext. PM9600FXMT *189

Robotics	
Sportster 9600 FAX	Int. 188498 *189
	Ext. 188449 *179
Sportster 14.4 Fax	Int. 188496 *189
	Ext. 188446 *209

World Port 14.4	
V.42 bis Fax	Ext. 188490 *399
Courier V.32bis Fax	Int. 188434 *399
	Ext. 188433 *439

Video Cards

FLEX ultimate	
Super X VGA - 1MB	*79
Super X Plus - 1MB	*99
Super X Plus VLB - 1MB	*119
Video Card PowerGraph VLB - 1MB	*189

DIAMOND	
SpeedStar Pro - 1MB	*124
SpeedStar Pro VLB - 1MB	*134
Stealth Pro VLB - 2MB	*369
Viper VLB - 2MB	*409

PARADISE	
ISA Accelerator Card - 1MB	*109
VL BUS Accelerator Card	*129

ORCHID	
ProDesigner II/s - 1MB	*149
Fahrenheit 1280 + - 1MB	*179
Fahrenheit 1280 + VLB - 1MB	*189
Fahrenheit VA - 1MB	*209
Fahrenheit VA VLB - 1MB	*229

ATI	
GRAPHICS ULTRA + 1MB	*289
GRAPHICS ULTRA + 2MB	*329
GRAPHICS ULTRA PRO 1MB	*429
GRAPHICS ULTRA PRO 2MB	*489
GRAPHICS ULTRA PRO VLB 2MB	*519

Math Coprocessors

80287-XL 8, 10, 16, 20 MHz	*85
80387-SX 16, 20, 25 MHz	*79
80387-SL 16, 20, 25 MHz	*79
80387-DX 16, 20, 25, 33 MHz	*85
Ask about OverDrive™ Processors	

INTEGRATED INFORMATION	
3C87SX-20 MHz	*69
3C87SX-25 MHz	*75
3C87SX-33 MHz	*75
3C87-33 MHz	*79
3C87-40 MHz	*89

Cyrix	
387DX 33MHz D1-CY387DX33	*89
387SX 33MHz D1-CY387SX33	*99
387DX 40MHz D1-CY387DX40	*95

Sound Cards

Sound Blaster Pro Deluxe DI-CLDELUXEP	*129
Sound Blaster 16 ASP DI-CL16ASP	*229
Creative Labs Speakers DI-CT-38	*49
Aztech NXII DI-NXII	*89

Printers

The Next Generation of IBM LaserPrinters by Lexmark... The New IBM 4039 Laser Printer Series

NEW LaserPrinter	
10R 10 ppm, 39 type 1 & 13 CG fonts, 2MB, 600/300 dpi* 403910R	*1369
NEW LaserPrinter 10D (Duplex)	
10 ppm, 39 type 1 & 13 CG fonts, 2MB, 600/300 dpi* 403910D	*1879
NEW LaserPrinter 12R	
12 ppm, 39 type 1 & 13 CG fonts, 4MB, 600/300 dpi* 403912R	*1729
NEW LaserPrinter 12L (LAN)	
12 ppm, 39 type 1 & 13 CG fonts, 2MB, 600/300 dpi* 403912L	*2459
NEW LaserPrinter 16L (LAN)	
16 ppm, 39 type 1 & 13 CG fonts, 2MB, 600/300 dpi* 403916L	*2799

* 600 dpi or 300 dpi w/PQET.

IBM 4019 & 4029 LASER PRINTER SERIES BY LEXMARK™

LaserPrinter E 5 ppm, 10 bitmap fonts, 512K, 300 dpi 4019E01	*749
LaserPrinter 6 6 ppm, 17 scalable & 10 bitmap fonts, 512K, 300 dpi 4029020	*959
LaserPrinter 10 5 ppm, 10 bitmap fonts, 1MB, 300 dpi** 4029030	*1129

**Exp. to 600 dpi w/the addition of 5MB + PS.

IBM PORTABLE PRINTERS BY LEXMARK™

2.5 lbs. with battery, 360 dpi, battery operated, 53 LQ, 1 year Lexmark™ Express Service. Black 5183010 or White 5183020	*349
--	------

EPSON LASER PRINTERS

ACTION LASER 1000 - 6 ppm, 14 fonts, 300 dpi, 512K	*829
ACTION LASER 1500 - 6 ppm, 14 fonts & 13 scalable 300 dpi, 512K	*749
EPL-8000 - 10 ppm, 14 fonts, 300 dpi, 1MB	*849

EPSON DOT MATRIX PRINTERS

LX-810 N-carr., 240 X 216 dpi, 3 fonts	*169
AP 3250 N-carr., 360 dpi, 6 fonts	*189
FX-870 N-carr., 240 X 216 dpi, 4 fonts	*264
FX-1170 W-carr., 240 X 216 dpi, 4 fonts	*349
LQ-570+ N-carr., 360 dpi, 14 fonts	*239
LQ-1070 W-carr., 360 dpi, 12 fonts	*349
LQ-870 N-carr., 360 dpi, 12 fonts	*429
LQ-860 Color N-carr., 360 dpi, 4 fonts	*584
LQ-1170 W-carr., 360 dpi, 12 fonts	*569
LQ-2550 Color W-carr., 360 dpi, 8 fonts	*889
DFX-5000 W-carr., 240 X 216 dpi, 533* cps, 80-NLQ, 3 fonts	*1,269
DFX-8000 same as DFX-5000 with 1066* cps and 192-NLQ	*2,139

*Super draft mode

Dataproducts LASER PRINTERS

LZR 960 Adobe® PostScript™, 9 ppm, 2 MB, 35 fonts, 300 dpi	*1399
LZR 965 Adobe PostScript, 9 ppm, 8MB, 35 PostScript & 6 PCL fonts, 300/600 dpi ...	*1899
LZR 1560 Adobe PostScript, 15 ppm, 4 MB, 35 fonts, 11 x 17, 300/400 dpi	*2999
LZR 1555 15 ppm, 4 MB, 13 scalable & 14 bitmap fonts, 11 x 17, 300/400 dpi	*2999
NEW JOLT™ Adobe PostScript Color Printer 300 dpi, 1MB, Windows 3.0 comp.	*4399

Protect Your Investment For Just Pennies A Day!

NOW Extend the manufacturer's warranty for that extra bit of assurance. Ask your FLEX sale consultant for details and prices on our warranty upgrade programs.

Printers

NEC



NEW LOWER PRICES ON NEC Models 95f, 95fx, 97 & 97fx

Silentwriter 95f

- PostScript printer • 6 ppm
- 35 scalable Adobe fonts • 22 internal fonts
- 2MB • 300 dpi • Built-in env. feeder **\$1249**
- Silentwriter 95fx** Same as model 95 Upgraded with s/r fax capability. **\$1449**
- Silentwriter 97** Same as model 95 Upgraded to 10 ppm and accepts 9510 fax bit **\$1499**
- Silentwriter 97fx** Same as model 97 Upgraded with s/r fax capability. **\$1699**

NEC Silentwriter 990 PostScript™ Laser
 RISC processor, max. 8 ppm, 35 scalable Adobe fonts, 14 bitmap fonts, 300 dpi, 2MB and 200 sht. letter cass ... **ONLY..\$990**

Canon BJ-200 BUBBLE JET PRINTER

- 4 ppm • 248 cps
- 360 dpi • 7 fonts
- 49 KB buffer
- Parallel / F • 6.6 lbs.

BJ-200 Multi-In Rebate
 Flex Price **\$329**
 Multi-In Rebate **\$50**
 Your Cost After Rebate **\$279**
 Offer Ends May 30, 1993

- BJ-5** 360 dpi, 37K, 6 fonts, 142 cps **\$199**
- BJ-10ex** 360 dpi, 37K, 6 fonts, 142 cps **\$244**
- BJ-300/330** 360 dpi, 30K, 3 fonts, 600 cps
- BJ-300** (nar.carr.) **\$329** **BJ-330** (wide.carr.) **\$499**
- BJC-800/820 Color** Prints 11 x 17, 360 dpi, 7K, built-in auto sheet feeder, 600 cps
- BJC-800** (parallel) **\$1549** **BJC-820** (scsi) **\$1659**
- LBP-4SX** 4 ppm, 300 dpi, 1 MB, PCL5 **\$699**

Panasonic LASER PRINTERS

- KX-P4410** - 5 ppm, 28 fonts, 300 dpi, 512K **\$599**
- KX-P4430** - 5 ppm, 28 fonts, 300 dpi, 1MB **\$449**
- KX-P4450i** - 11 ppm, 28 fonts, 512K **\$1039**
- KX-P4451** - 11 ppm, 28 fonts, 1MB **\$1349**
- KX-P4455 P5** - 11 ppm, 39 fonts, 512K **\$1679**

Panasonic DOT MATRIX PRINTERS

- KX-P2180** N.carr., 240x216 dpi, 9 fonts **\$159**
- KX-P1123** N.carr., 360 dpi, 7 fonts **\$194**
- KX-P2023** N.carr., 360 dpi, 7 fonts **\$199**
- KX-P2123** N.carr., 360 dpi, 10 fonts **\$224**
- KX-P1124i** N.carr., 360 dpi, 10 fonts **\$275**
- KX-P2124** N.carr., 360 dpi, 12 fonts **\$299**
- KX-P1624** W.carr., 360 dpi, 7 fonts **\$324**
- KX-P1695** W.carr., 240x216 dpi, 8 fonts **\$344**
- KX-P1654** W.carr., 360 dpi, 10 fonts **\$514**
- KX-P2624** W.carr., 360 dpi, 11 fonts **\$354**

HP Faxes & Access.

HEWLETT PACKARD



HP Plain Paper FAX

HP FAX-200 Plain-paper, cut sheet printing, 12 page memory, 50 number memory **\$448**

HP FAX-310 Plain-paper, cut sheet printing, 28 page memory, 100 number memory, S/R fax **\$1279**

Genuine HP Accessories

- Black Toner Cartridge** 1-3 4+
- LaserJet II, IID, III IID 92295A** **\$79** **\$76**
- LaserJet IIP & IIP 92275A** **\$61** **\$59**
- LaserJet 92285A** **\$82** **\$79**
- LaserJet IIISi 92291A** **\$119** **\$115**
- LaserJet 4, 4M 92298A** **\$99** **\$96**

ORDER INFORMATION: Minimum order \$80. Minimum shipping and handling per order \$11.95. MasterCard, Visa and Discover accepted for USA, Canada, APO, FPO and Puerto Rico. PLECARD accepted for continental USA only. A \$10 surcharge on credit card orders for APO, FPO and Puerto Rico. C.O.D. order under \$500.00, and \$5.00 over \$500.00, add \$10.00 check/warranty charge. Call for special UPS/Rail/Blue C.O.D. rates. APO/FPO add 5% to cover additional shipping and handling. Call for PAL rates. CORPORATE/GOVERNMENT ORDERS: Corporate rates including 1% or better and government agencies accepted on Net 30 terms with receipt of a valid purchase order. Leaving Plans available for qualified businesses only. RETURN POLICY: INFORMATION: All returns must have prior authorization from our Customer Service Department (1-708-351-7372). All returns must be in as-shipped condition, with original packaging, including all warranty cards and manuals. Incomplete product returns, unauthorized returns and reshipments are subject to a minimum 20% restocking charge. We will only accept returns on unopened and non-downloaded software. Software compatibility guaranteed only if we have downloaded it on your new FLEX system. Thirty (30) day money back guarantee applies to FLEX system only. (Does not include printers or other non-installed peripherals). All prices and specifications subject to change without notice. Not responsible for typographical or printing errors. IBM is a registered trademark of International Business Machines Corporation in the United States and/or other countries and is used under license. Lexmark is a trademark of Lexmark International, Inc. Personal Printer Series is a trademark of International Business Machines Corporation in the United States and/or other countries and is used under license. All trademarks and registered trademarks are of their respective holders. ©1993 USA FLEX.

USA FLEX • 471 Brighton Drive, Bloomingdale, IL 60108

Compaq Systems

COMPAQ

Hotline

1-800-677-8575

COMPAQ ProLinea*

From... \$699

- ProLinea 3/25e**, 386/SX-25, 2MB, DOS 40MB **\$699**
- 84MB, Win, PFS, mouse 141600-005 **\$779**
- ProLinea 3/25e**
- 386/SX-25, 2MB, DOS, Win, mouse 84MB **\$629**
- 120MB 141650-007 **\$669**
- 386/SX-25, 2MB, DOS, Win, PFS, 5.25 FD, mouse 84MB **\$699**
- 120MB 141650-005 **\$699**

*Monitor Not Included
COMPAQ Portables From... \$1449

- Centura 3/25**
- 386/SL-25, 4MB, DOS, Win, PFS, trklbl 84MB **\$1,449**
- 120MB 139400-006 **\$1,589**
- Centura 3/25c**
- 386/SL-25 (color), 4MB, DOS, Win, trklbl 84MB **\$1,979**
- 120MB 139410-005 **\$2,119**
- LTE Lite/25C**
- 386/SL-25 (color), 4MB, DOS, Win, trklbl 84MB **\$2,969**
- 120MB 138250-004 **\$3,549**
- LTE Lite/25E**
- 386/SL-25 (mono), 4MB, DOS, Win, EasyPoint 84MB **\$2,799**
- 120MB 138000-004 **\$2,989**

COMPAQ Monitors**

- 14" VGA Color** 640 x 480 graphic res., .31mm 122917-001 **\$329**
- 14" 1024 Color** 1024 x 768 graphic res., .28 mm 141564-001 **\$419**

**COMPAQ monitors can only be sold with COMPAQ Systems.

CompaqCare

3 Year Limited Warranty with 1 Year On-Site*
 Worldwide Limited Warranty on Portables Only
 24 Hour Toll Free Technical Support (From USA Flex)
 *Applies to all current COMPAQ products only.

Tape Backup

COLORADO MEMORY SYSTEMS INC.

- JUMBO 120** - 120MB storage capacity
- INT. D1-JUMBO **\$149**
- EXT. D1-JUMBO & D1-KE-10 **\$239**
- JUMBO 250** - 250MB storage capacity
- INT. D1-DJ-20 **\$209**
- EXT. D1-DJ-20 & D1-KE-10 **\$295**
- JUMBO TRAKKER™**
- 120MB D1-JT10 **\$339** 250MB D1-JT20 **\$399**
- NEW POWERTAPE™**
- 2 GB Int. D1-PT-25 / Ext. D1-PTE-25 **CALL**
- 4 GB Int. D1-PT-50 / Ext. D1-PTE-50 **CALL**
- 3M Magnus 2GB** **\$39.95**

3M Data Cartridges

3M

- Unformatted Sold in Fives**
- DC2000** 40/80MB **\$18.95ea.**
- DC2080** 80/160MB **\$21.95ea.**
- DC2120** 120/250MB **\$23.95ea.**
- DC600A** **\$20.49ea.**
- DC6150** 250/500MB **\$21.49ea.**
- DC300XLP** **\$18.69ea.**
- DC6250** 250/500MB **\$25.49ea.**
- DC6525** 350/700MB **\$32.95ea.**

- Formatted Sold in Fives**
- DC2000** Thetamat (QIC 40) **\$18.95ea.**
- DC2060** Thetamat Extra Length **\$24.95ea.**
- DC2080** Rhomat Extra Length (Irwin 80) **\$24.95ea.**
- DC2120** Ximat (QIC 80) **\$26.95ea.**
- DC2060** Kappmat (Irwin) **\$25.95ea.**
- Magnus™** 1GB/2GB **\$34.95/\$39.95ea.**

COMPAQ DESKPRO*

From... \$1349

- DESKPRO 3/25i** - 386/DX-25, 4MB, DOS 84MB, Win, mouse. 141000-407 **\$1,349**
- 120MB 141000-403 **\$1,399**
- DESKPRO 3/33i** - 386/DX-33, 4MB, DOS, Win, mouse. M1** 141100-401 **\$1,199**
- 84MB 141100-407 **\$1,349**
- 120MB 141100-408 **\$1,449**
- DESKPRO 4/25i** - 486/SX-25, 4MB, DOS, Win, mouse. 84MB 141200-407 **\$1,349**
- 120MB 141200-408 **\$1,449**
- 240MB 141200-409 **\$1,629**
- DESKPRO 386/33M** - 386/DX-33 EISA, 120MB, 4MB 141500-003 **\$1,929**
- W/DOS, Win, QVision, Audio, mouse 141500-004 **\$2,149**
- DESKPRO 486/25M** 486/SX-25 EISA 120MB, 8MB 129200-003 **\$1,839**
- W/DOS, Win, QVision, Audio, mouse 129200-004 **\$2,049**
- DESKPRO 486/33M** 486/DX-33 EISA M1** 129300-001 **\$1,859**
- 120MB, 4MB 129300-002 **\$2,109**
- W/Win, QVision, Audio, mouse 129300-004 **\$2,379**
- DESKPRO 50M**, 486/DX2-50 EISA, 8MB, QVision M1** 129400-001 **\$2,359**
- 120MB 129400-002 **\$2,519**
- 340MB 129400-003 **\$3,199**
- DESKPRO 50M**
- 486/DX2-50 EISA, 8MB, DOS, Win, QVision, Audio, mouse. 120MB 129400-004 **\$2,739**
- 340MB 129400-005 **\$3,329**
- DESKPRO 68M M1**** 486/DX2-66 EISA, 8MB, QVision 139000-001 **\$2,589**
- DESKPRO 68M M510/w** 486/DX2-66 EISA, 510MB, 8MB, DOS, Win, QVision, Audio, mouse 139000-003 **\$3,819**

*Monitor Not Included. ** All M1 models can be configured w/HDD and other access. Ask for details.

Flex Software Support Bundle!

- Toll-free software support, 24 hours, 7 days a week for 1 year
- Over 1,000 programs supported
- PLUS** Free 1 Hour Training Video on "How to use Windows 3.1!"

Only... \$59
 With purchase of COMPAQ System!

Tripp Lite Protection

TRIPP LITE
 "THE POWER PEOPLE"



- ISOBAR® Command Console Plus** (\$10,000 Protection) D1-CC6PLUS **\$75**
- ISOBAR® Surge Suppressors** (\$10,000 Protection)
- Isobar 4 **\$46** Isotel 4 **\$59**
- Isobar 6 **\$51** Isobar 8 **\$69**
- Standby UPS/BC & BC-LAN Systems** (\$25,000 Protection)
- BC 500 LAN **\$229**
- BC 250 **\$109** BC 600 LAN **\$269**
- BC 400 **\$169** BC 750 LAN **\$329**
- BC 500 **\$199** BC 900 LAN **\$379**
- OMNIPower® Standby UPS Systems**
- OMNI-600 LAN** (\$50,000 Protection) **\$399**
- ISOBAR® Ultra Surge Suppressors** (\$25,000 Protection)
- Isobar Ultra 8 **\$69**
- Isobar Ultra 4 **\$49** Isotel Ultra 6 **\$64**
- Isobar® Ultra 6 **\$59** Isotel Ultra 8 **\$74**

USA FLEX
1-800-766-1940

(708) 582-6206 • FAX (708) 351-7204

Government & Education Sales 1-800-395-7025
 Government & Education FAX (708) 351-9871
 Habla Espanol 1-800-723-5500 • (708) 924-6780
 Pour les Francophones
 1-800-723-2256 • (708) 582-6179
 Verhandlungen in deutsch (708) 924-6680
 (7:00 Uhr bis 15:00 Uhr)
 (Midnight to 9:00 a.m. est)
 Code # PM06A3



CIRCLE 051 ON READER SERVICE CARD

QB DOS.BAS

Complete Listing

```

***** QB DOS.BAS - reads file names from disk

'Copyright (c) 1993 Ethan Winer

DEFINT A-Z
DECLARE FUNCTION GetAttr% (FileName$)
DECLARE FUNCTION SetAttr% (FileName$, Attribute)
DECLARE FUNCTION QBDIR$ (FileSpec$)
DECLARE SUB Interrupt (IntNum, InRegs AS ANY, OutRegs AS ANY)

'---- Define the TYPE required by CALL INTERRUPT
TYPE RegType
    AX    AS INTEGER
    BX    AS INTEGER
    CX    AS INTEGER
    DX    AS INTEGER
    BP    AS INTEGER
    SI    AS INTEGER
    DI    AS INTEGER
    Flags AS INTEGER
END TYPE

DIM SHARED DTA AS STRING * 44      'this is DOS' work area
DIM SHARED Regs AS RegType        'used by CALL Interrupt
DIM SHARED LocalSpec AS STRING * 80 'using a fixed-length string
                                   'supports both QB and PDS

'***** Beginning of demonstration portion, remove the following code
'when adding this module to another program.

CLS
Path$ = "C:\QB45\"                'use "" for the current directory
Spec$ = Path$ + "*", "*"          'find all matching files

DO
    This$ = QBDIR$(Spec$)          'read the name of first one
    IF This$ = "" THEN EXIT DO     'none found, all done
    PRINT This$                   'print the name

    Attr = GetAttr%(Path$ + This$) 'read its attributes
    IF Attr AND 1 THEN PRINT SPC(1); "Read-only";
    IF Attr AND 2 THEN PRINT SPC(1); "Hidden";
    IF Attr AND 4 THEN PRINT SPC(1); "System";
    IF Attr AND 32 THEN PRINT SPC(1); "Archive";

    PRINT                          'kick out a new line
    Spec$ = ""                     'clear Spec$ to find the rest
LOOP
'***** END OF DEMO

FUNCTION GetAttr% (FileName$) STATIC
    LocalSpec$ = FileName$ + CHR$(0) 'add a CHR$(0) for DOS
    Regs.AX = &H4300                 'get attribute service

    Regs.DX = VARPTR(LocalSpec$)
    CALL Interrupt(&H21, Regs, Regs) 'show DOS where the local copy is
    'read the attributes

    GetAttr% = Regs.CX AND &HFF       'assign the output
    IF Regs.Flags AND 1 THEN          'oops, there was an error
        GetAttr% = -1                'return -1 as a flag
    END IF

END FUNCTION

FUNCTION QBDIR$ (Spec$) STATIC
    LocalSpec$ = Spec$ + CHR$(0)      'add a CHR$(0) for DOS
    Regs.AX = &H1A00                  'assign DTA service
    Regs.DX = VARPTR(DTA)             'show DOS where to place it
    CALL Interrupt(&H21, Regs, Regs)

    IF LEN(Spec$) THEN                'find first matching file
        Regs.AX = &H4E00
    ELSE
        Regs.AX = &H4F00              'find subsequent file names
    END IF

    Regs.CX = 39                      'any file attribute okay
    Regs.DX = VARPTR(LocalSpec$)
    CALL Interrupt(&H21, Regs, Regs) 'show DOS where the local copy is
    'see if there's a match

    QBDIR$ = ""                       'assume no matching file is present
    IF (Regs.Flags AND 1) = 0 THEN     'if the Carry flag is clear, a
        FileName$ = MID$(DTA, 31, 13) 'file was found and its name
        Zero = INSTR(FileName$, CHR$(0)) 'is in the DTA with a trailing
        QBDIR$ = LEFT$(FileName$, Zero - 1) 'CHR$(0)
    byte, strip the zero
    END IF

END FUNCTION

FUNCTION SetAttr% (FileName$, Attribute) STATIC
    LocalSpec$ = FileName$ + CHR$(0) 'add a CHR$(0) for DOS
    Regs.AX = &H4301                  'set attribute service
    Regs.CX = Attribute
    Regs.DX = VARPTR(LocalSpec$)
    CALL Interrupt(&H21, Regs, Regs) 'show DOS where the local copy is
    'assign the new attributes

    SetAttr% = 0
    IF Regs.Flags AND 1 THEN          'oops, there was an error
        SetAttr% = -1                'return -1 as a flag
    END IF

END FUNCTION

```



Figure 7: This file contains a demonstration and three functions that let you read filenames, as well as read and set their file attributes.

the first filename that matches this specification. To find subsequent matching files, invoke QBDIR\$ repeatedly, using a null string (""). QBDIR\$ returns a null string to indicate that no more matching files were found. Notice that QBDIR\$ accepts an optional drive letter and path for the search specification, but returns only filenames. Callers must merge the path with the filenames returned by QBDIR\$ before the file can be accessed. This is shown in the code's demonstration portion where each file's attributes are read.

The GetAttr function accepts a filename, and returns the file's attributes bit-coded as an integer value. BASIC's AND operator is used to isolate each attribute bit, as shown in the demonstration. SetAttr is also designed as a function; it returns 0 if the file's attributes were modified successfully, or -1 if there was an error such as "File not found." In most cases you will use SetAttr to set or clear only one of a file's several attributes. Therefore you will need to invoke GetAttr to read the current attributes, and then use OR to set the desired new attributes using the same values (1, 2, 4, or 32) shown in the GetAttr demonstration. For example, to set the Read-only attribute for a file named ACCOUNTS.DAT, you would do this:

```

Attr%=GetAttr%("ACCOUNTS.DAT")
Attr%=Attr% OR 1 'set Read-only bit
ErrCode=SetAttr%
("ACCOUNTS.DAT", Attr%)
IF ErrCode THEN
    PRINT "An error occurred."
END IF

```

To clear an existing attribute, you must follow a slightly more complicated procedure:

```

Attr%=GetAttr%("ACCOUNTS.DAT")
Attr%=Attr% AND NOT 1
'clear Read-only attribute
ErrCode=SetAttr%("ACCOUNTS.DAT",
    Attr%)
IF ErrCode THEN
    PRINT "An error occurred."
END IF

```

In this case you have to clear the individual bit that corresponds to a single attribute. BASIC's AND and NOT operators solve this handily.

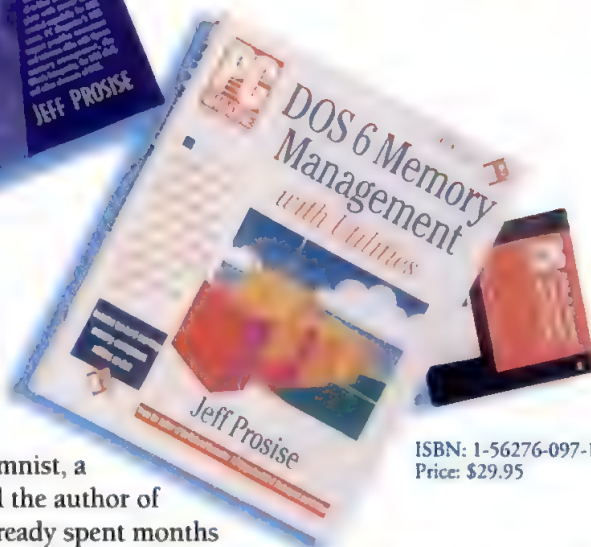
QB DOS is available for downloading from the Programming Forum on PC MagNet.—Ethan Winer □

New DOS 6 Utilities From Jeff Proise



ISBN: 1-56276-095-5
Price: \$39.95
Avail.: June

Plus Two
Great Books!



ISBN: 1-56276-097-1
Price: \$29.95

Jeff Proise designs some of the world's best DOS utilities, according to legions of *PC Magazine* and *PC/Computing* readers. Most think he's a darn good writer, too.

Proise, *PC Magazine*'s "Tutor" columnist, a *PC/Computing* contributing editor, and the author of two best-selling books on DOS, has already spent months exploring DOS 6. He's mastered its powers, unearthed its secrets—and written some of the finest utilities ever to hit the scene. Now, in two exciting disk/book combos, Proise offers you these utilities to supercharge your system and heighten your productivity. The utilities were written by Proise exclusively for his readers and are included in the price of the book.

PC Magazine DOS 6 Memory Management with Utilities: Jeff Proise reveals hidden memory areas and memory-saving DOS techniques—many of them previously undocumented—and guides you as you put them to work.

PC Magazine DOS 6 Techniques and Utilities (available in June): Productivity solutions from *PC Magazine*'s DOS wizard! Optimize your system configuration, streamline your batch files, write custom programs with QBasic, and much more.

© 1993 Ziff-Davis Press



Receive \$1 OFF when you buy either book, or \$3 OFF when you buy both... At any Waldenbooks, WaldenSoftware or Brentano's Book Store when you present this coupon.

Preferred Readers and Preferred Customers save 10% everyday and get the points. Join and Save!

Waldenbooks®

Waldensoftware®

B R E N T A N O'S.

Tender on Coupon Code #56

Offer Expires on 6/30/93

CIRCLE 069 ON READER SERVICE CARD

1 OF THE
NATION'S
LARGEST
TOSHIBA
AUTHORIZED
DEALERS

**WHY SETTLE
FOR LESS?**

**CDW® Sells
For Less**

AND SERVICES YOU BETTER

T4400C Color/486SX/25 120MB OR 200MB

COLOR ACTIVE MATRIX

✓ 256 Simultaneous "Super VGA" Colors at 640 x 480 Resolution ✓ Color TFT-LCD Active Matrix Resolution ✓ 4 MB RAM Exp. to 20 MB ✓ 8 KB Cache in CPU ✓ Upgradable to i486DX-25 ✓ Port For External VGA Monitor ✓ VGA Compatible with 640 x 480 Pixel Graphics Display ✓ Real Time Clock/Calendar ✓ Full-Function, Standard Key-Speed, 82-Key Sculptured Keyboard ✓ MS-DOS® 5.0 Operating System ✓ One Year Limited Warranty on Parts and Labor with No-Cost Exceptional Care Enrollment During This Period

120 MB Color Active Matrix..... **CALL 25488**

200 MB Color Active Matrix..... **CALL 25542**



TOSHIBA PERFORMANCE, TOSHIBA QUALITY, TOSHIBA VALUE

TOSHIBA

**TOSHIBA
T4500/
T4500C
486SX 20MHz**

✓ i486SX/20 Processor
✓ MaxTime™ Power Management System 3.3 Volt Technology for Extended Battery Life
✓ 4 MB RAM, Exp. to 20 MB
✓ 8KB Cache ✓ 640 x 480 Display
✓ Simultaneous Display on External Monitor ✓ BallPoint™ Mouse with QuickPort™ ✓ 18mm "Hot Plug" PCMCIA Slot

✓ Windows 3.1, DOS 5.0 and UltraFont Software ✓ 1 Parallel, 1 Serial, 1PS/2 Mouse and 1 PS/2 Keyboard Ports ✓ 1 150-Pin Bus Connector ✓ Monochrome: 9.5" Diagonal, 64 Gray Scales. Color: 8.5" Diagonal, TFT-LCD Active Matrix 256 Color Display

80 MB Monochrome **\$2327.62** CDW25545

120MB Monochrome **\$2489.98** CDW 25546

120 MB 256 Act. Matrix **\$3659.32** CDW 25551



**TOSHIBA T6400/T6400C
Color**

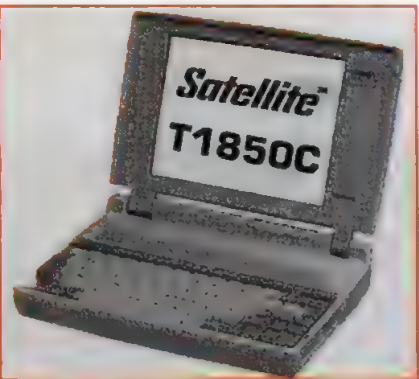
**FOR POWER USERS
WHO DEMAND A FULLY
EQUIPPED MOBILE
PLATFORM AND CANNOT
AFFORD TO LEAVE ANYTHING
BEHIND WHEN THEY LEAVE
THE OFFICE.**

✓ i486™ /33DX or DX2/50 Processor
✓ 8KB Cache in CPU ✓ 4 MB RAM Std., Exp. to 36 MB RAM ✓ 200 MB Hard Drive with 12 msec. Access ✓ 1.44 MB 3.5" Floppy
✓ 640 x 480 VGA ✓ Port For External Super VGA Monitor

✓ TFT Active Matrix Color 256 Colors, Super VGA ✓ Full 101 Key Detachable Keyboard
✓ One Full Size 16-Bit ISA Exp. Slot ✓ 9 Pin Serial Port ✓ 150-Pin Exp. Bus Connector
✓ MS-DOS® 5.0 ✓ One Year Parts and Labor With No-Cost Exceptional Care Enrollment During This Period

486 /50 DX2 200 MB Gas Plasma. **\$3839.25** CDW 27021

486 /50 DX2 200 MB Color..... **\$5699.33** CDW 27023



TOSHIBA

TOSHIBA T1850 120MB Bundle

**Pre-Installed Software: Win3.1, DOS,
Ultrafont, Trackball Mouse, Instructional Video**

✓ Maxtime Power System Lets You Work Longer ✓ Auto Resume Electronic Bookmark ✓ Low Battery Warning Light & Alarm ✓ Auto Shut Down of Display & HD
✓ Auto CPU "Sleep Mode" ✓ Power On Password Protection
✓ 25 MHz i386™SX Processor ✓ 4 MB RAM Expandable to 12 MB ✓ 1.44 MB 3.5" Diskette Drive ✓ Fluorescent Sidelit Black and White STN-LCD with 64 Gray Scales and Adjustable Contrast

120 MB TOSHIBA BUNDLE..... **\$1453.44** CDW 27028

TOSHIBA T1850C Color:
EXTRAORDINARY QUALITY

✓ 25 MHz i386™SX Processor ✓ 4 MB RAM Expandable to 12 MB ✓ 80 MB Hard Drive ✓ 1.44 MB 3.5" Diskette Drive
✓ High Resolution, Ultra-STN LCD with 256 Colors from a Palette of 262,144 ✓ 2+ Hours Battery Life ✓ One Year International Warranty ✓ Weighs only 7.3 lbs.

80 MB Color..... **\$1826.88** CDW 24663

120 MB Color..... **\$1951.15** CDW 25643

\$300 Retail Value

AT CDW® YOU GET MORE COMPUTING FOR YOUR BUCK. CALL NOW!

♦ **CDW® means Service** ♦ **CDW® means Savings** ♦ **CDW® means Business** ♦ **CDW® means Experience**
♦ **CDW® means Technology** ♦ **CDW® means Networking** ♦ **CDW® means Computing** PCM684

**FREE TECHNICAL SUPPORT
FOR CDW® CUSTOMERS
(708) 291-7575**

(800) 326-4CDW
WE SELL NAME BRANDS FOR LESS!

©1993 CDW® Computer Centers, Inc.

**ALWAYS WORKING TO
KEEP YOUR COMPUTING
ONE STEP AHEAD**

High Volume Bids Invited

COMPUTER DISCOUNT WAREHOUSE

Canon BJ-200 BubbleJet Personal Printer

PC Magazine says, "...many users will be hard-pressed to see any difference between this and laser printed pages without resorting to a magnifying glass." December 22, 1992

- ✓ Multi-Purpose Feeder Holds 100 Sheets Letter/Legal Paper and Feeds Them Automatically ✓ 49KB RAM
- ✓ 8KB Cache ✓ Parallel Interface ✓ Operates at 42 dbA or Less
- ✓ Canon Native, Epson® LQ and IBM X24E Emulations
- ✓ Weighs 6.6 lbs ✓ 2 Year Limited Warranty



CDW Price **\$279.12*** CDW 24844

* with Mr's \$50 End-User Rebate. Rebate Ends 5/30/93

WHY SETTLE FOR LESS?

CDW® SERVICING YOUR COMPUTER NEEDS SINCE 1982

Intel Ether Express™ 16, 16TP & 16C LAN Adaptors

- ✓ SoftSet® Autoconfiguration
- ✓ Installs and Configures in Less than 5 Minutes ✓ On-board, On-Network, and Responder
- ✓ Diagnostics ✓ Supports Twisted-Pair and Thick-Wire Ethernet
- ✓ Cabling ✓ Two Data Transfer Modes—Shared Memory or I/O Data Transfer



CDW Price **\$119.33** CDW 20754

HARDWARE, SOFTWARE & PERIPHERALS AT DISCOUNT PRICES

NETWORKING PRODUCTS

TERMINAL SERVERS	
5043T 10BT Ethernet	122.96
5046T 10BT PS/2 Ethernet	289.14
5055 8 Port 10BT Concentrator	349.59
4 Port Passive Hub	39.89
4035 4MBPS Token Ring Adapter	286.49
6242TP+ 8Bit TP Arcnet	98.48
6245 16-Bit Arcnet, Coax, TP, TP+	178.47
6242 Arcnet 8-Bit	56.29
6246 PS/2 Board Arcnet	56.29
6151-11 16 Port Smart Hub	709.01
6151 16 Port Arcnet Smart Hub	738.86
4045 16M Token Ring XT/AT	406.29
8Port Twisted Pair Active Hub	346.89
100MBPS TCNS EISA Fiber Optic	986.18
100 MBPS TCNS Smart Hub 6 Coax	1396.20
100 MBPS TCNS 16 Bit Twisted Pair	719.22
100 MBPS 3047CX TCNS 32bit EISA Coax Adapt	625.58

NOVELL

NOVELL Network V4.0	CALL
NOVELL Network V2.2 5 User 3.5"	489.50
NOVELL Network V2.2 10 User 3.5"	599.73
NOVELL Network V2.2 10 User 5.25"	1099.79
NOVELL Network V2.2 100 User 3.5"	2058.57
NOVELL Network V3.11 5 User 3.5"	552.17
NOVELL Network V3.11 10 User 3.5"	1252.17
NOVELL Network V3.11 20 User 3.5"	1752.17
NOVELL Network V3.11 50 User 3.5"	2602.17
NOVELL Network V3.11 100 User 3.5"	3496.96
NOVELL Lite Server Kit	398.77
NOVELL Lite Add-On Kit	186.66
NOVELL SFT III V3.11 5 User	1719.33
NOVELL SFT III V3.11 10 User	2836.34
NOVELL SFT III V3.11 20 User	3484.39
NOVELL SFT III V3.11 50 User	4961.66
NOVELL SFT III V3.11 100 User	6533.63
NOVELL SFT III V3.11 250 User	12,540.34
ETHERNET Interface Connector (NE1000)	129.44
ETHERNET Board (NE2000)	130.06
ETHERNET EISA (NE2200)	587.90

ARTISOFT

AE1/T 10 Base T Adapter, 8-Bit ARS-190	109.52
AE2/T Ethernet ISA Adapter, 16-Bit ARS-170	179.58
AE3 Ethernet Adapter	219.26
Artisoft Modem Sharing	204.96
Central Station	399.66
NOS AI Software V5.0	58.50
NOS AI 12 User	621.07
E143 Ethernet Adapter Kit	184.79
LANtastic Ethernet Starter Kit	140.31
LANtastic AE2 Ethernet Starter Kit for Windows 480	140.31
LANtastic 10 Base T Starter Kit	99.30
LANtastic 2Mbps Adapter	129.54
LANtastic for Windows	149.17

CALL FOR ADDITIONAL ARTISOFT PRODUCTS

SMC

SMC 3402TP Transceiver AU/TP	129.82
SMC Arcnet Transceiver 8	60.88
SMC Transceiver Plus Pack	399.09
SMC Transceiver 8-Bit 10Base-T Pack	739.68
SMC Arcnet Expressor A-3200	339.70
SMC Transceiver 8-Bit 10Base-T Pack	689.09
SMC Arcnet Expressor A-3200	179.79
SMC Arcnet Expressor A-3200	659.55
SMC Arcnet Expressor A-3200	599.19
SMC Arcnet Expressor A-3200	131.60
Active Hub 8-Bit 10Base-T	229.88
Active Hub 8-Bit Twisted Pair	345.48
3008 Coax 8-Bit Ethernet	89.82
3008 TP 10Base-T 8-Bit Ethernet	99.53
3016 100 Mbit/sec 10Base-T Ethernet	125.50
PC Arcnet Plus Adapter 10Base-T 10-Bit	199.00
PC Arcnet Plus Adapter 10Base-T 10-Bit	110.88
PC Arcnet Plus Adapter 10Base-T 10-Bit	199.25

NETWORKING PRODUCTS

PC 600WS Coax Arcnet Workstation 16-Bit	119.86
SMC PC130 8-Bit Arcnet Coax	68.50
SMC PC130E 8-Bit Arcnet Coax	99.00
SMC PC270 TP Arcnet	193.33
EISA 3200 Arcnet Twisted Pair	736.06
SMC 8-Bit 10 Base T Ethernet Elite	119.48
SMC Ethernet Plus/A PS/2 Coax Elite	209.10
SMC 16-Bit Ethernet Plus Coax Elite	129.50
SMC 8-Bit Ethernet Plus Coax Elite	99.29
SMC Combo Ethernet TP, Coax, AUI Elite	155.57

3Com

3COM 3C503 TP 10 Base T	229.88
3COM 3C503-16 Etherlink II 16 Bit	183.64
3COM 3C507 Ethernet Card	278.81
3COM 3C503 Etherlink	189.24
3COM 3C509 TP Etherlink III	137.25
3COM Ethernet Repeater	629.03

Xircom

PCMCIA Ethernet 10 BT	374.52
Ext. Ethernet LAN Adapter RJ45AUI/BNC	393.92
PE210 BX LAN Adapter 10/100	285.96
PT128B3 16/4 Token Ring DB9	527.03
PT128B1 16/4 Token Ring RJ45	236.50/234.77
Ethernet Pocket Adapter Thin Coax 10BT200.55/229.55	
Ethernet Pocket Print Server	242.50
Paranet Port Multi	72.00
PT126BT Token Ring Pocket Adapter	539.23

TAPE, REMOVABLE & FLOPPY DRIVES

COLORADO	
COLORADO 4GB SCSI Power Tape	1529.10
COLORADO Jumbo 120	153.37
COLORADO Jumbo 250	219.32
COLORADO Tracker 120MB Portable Back-up	355.00
COLORADO Tracker 250MB Portable Back-up	419.21

Call For Accessories And Interfaces

MEGA

21 MB Floppy Internal Diskette Drive	309.89
21 MB Floppy Ext. Diskette Drive	379.19
Tape 250, 250MB Tape Back-up	199.10
Bernoulli PC Powered 90 Pro	489.25/589.57
Bernoulli Transportable 90 Pro	539.61
Bernoulli Transportable 150 Pro	855.25
Bernoulli Internal 90 Pro	549.47

SUMMIT

SUMMIT 120MB Int.	99.99
SUMMIT 250MB Int.	189.34
SUMMIT 306MB, Internal IDE 10MB/min	299.90

MICROSOLUTIONS

External 100MB HD	499.06
External 200MB Portable HD	582.95
Backup External Floppy 3.5"	189.41
Backup CD ROM	229.12
Backup External Floppy 5.25"	189.41
External 60-90MB Tape Backup	379.39

Mountain

MOUNTAIN T250 Internal Tape Back-up	219.50
MOUNTAIN 120MB External Tape Drive	439.80
MOUNTAIN 250MB Internal Backup	474.42
MOUNTAIN 304MB Internal IDE Backup	439.80
MOUNTAIN 250MB External Backup	1179.22
MOUNTAIN 2.0 Gigabyte External Floppy	1976.40
MOUNTAIN 4.0 Gigabyte, Int. 4mm DAT	1993.23
Slider 300MB Portable Tape Backup	519.71

Call For PS/2 Drives, Controllers, Accessory Kits and Tapes

IRWIN

IRWIN A120PC-120 MB Internal	175.19
IRWIN A250PC-250 MB Internal	209.89
IRWIN A120E-120 MB High Speed External	289.13
IRWIN A280E-280 MB High Speed External	319.86

Call For Controllers, Accessory Kits and Tapes

*While Quantities Last

No Surcharge For Credit Cards... Means LOWER Net Cost To You!

NETWORKING PRODUCTS

IBM TOKEN RING	
BM 16/4 PS/2 MCA	609.11
BM 16/4 XT/AT	498.27
IBM 16/4 Multi Access Unit MAU	432.26

INTEL NETWORKING

NTEL Token Express SA 16/4	599.88
NTEL Token Express 16 Bit Coax	119.53
NTEL Token Express 16 Bit TP	119.53
NTEL Token Express 16 Bit 10/4	399.23
NTEL Token Express 16 Bit 10/4	397.30
NTEL Token Express 16 Bit 10/4	499.43
BOH AND BLOW 10/4 LAN Pak	626.37
BOH AND BLOW 10/4 LAN Pak	244.30
CC Mail Products	CALL
HARVARD GRAPHICS LAN Pack	CALL
LOTUS 1-2-3, 2.4 Server	558.66
LOTUS 1-2-3, 2.4 Network Node	339.47
LOTUS 1-2-3, 2.4 Network Node	459.18
MICROSOFT Word 5.5 Network Node	185.39
MICROSOFT Excel Network Nodes	249.11
WORD PERFECT Office 5 User V 3.01	278.79
WORD PERFECT Office 5 User V 3.01	923.08

TERMINALS

WYSE 50 Amber or Green	349.15
WYSE 60 Amber or Green	279.92
WYSE 160/30 Amber or Green	327.98/274.89
WYSE 165 T320 Amber, Green or White	327.60
WYSE 150 Amber, Green or White	285.45
WYSE 165/30 Amber, Green or White	519.40/549.39

MULTIMEDIA, SOUND, CD'S, FAX

Advanced Digital Systems PC PrimeTime	389.14
Advanced Digital Systems VGA to TV Elite	287.21
Advanced Digital Systems Video Clipper	359.11
ARTISOFT, Wired for Sound	39.49
ATI Stereo FX Sound Card	89.76
COMET PC Communicator Data, Fax, V-Mail	139.56**
CD-ROM Software 5 CD's Bundle, Call For Titles	129.18
COREL SYSTEMS Artshow	179.25
COREL SYSTEMS Draw CD 1.0	419.29
CREATIVE LABS Int. CD-ROM Upgr Kit	308.31
CREATIVE LABS Sound Blaster	76.93
CREATIVE LABS Sound Blaster Deluxe	129.18
CREATIVE LABS Sound Blaster Pro MC	258.81
CREATIVE LABS Sound Blaster Pro 16	229.23
CREATIVE LABS Sound Blaster Professional	179.28
CREATIVE LABS MultiMedia Starter Kit	449.82
CREATIVE LABS MultiMedia Int. Upgrade Kit	549.82
CREATIVE LABS Video Blaster	349.46
CREATIVE LABS Video Blaster Windows	338.29
HP Plan PaperFax 200/310	968/1269.10
INTEL Smart Video Recorder	497.64
KEYTRONICS Multi Keyboard	95.50
KeyTronics SoundMan	177.83
MICROSOFT Windows 95 for Windows CD	49.50
MICROSOFT Backshelf for Windows	119.20
MICROSOFT Windows Dev. Kit Windows	309.40
MICROSOFT Programmer's Library	249.75
MICROSOFT Windows 95 System	179.83
MICROSOFT Works for Windows CD	119.20
ORCHID Sound Producer	149.43
PRACTICAL PERIPHERALS FAX ME	175.50
SIRIUS Publishing PC Karaoke	89.26
SONY Desktop Libraries, Int. & Ext.	CALL

**HP Manufacturer's \$150 End-User Rebate

CD-ROM & OPTICAL DRIVES

HITACHI 1700SA External	409.30
HITACHI 1700SA External	467.42
MAGNAVOX Int. MPC CD ROM	329.00
NEC CD-ROM Express Pro	379.40
NEC CD-ROM 74-1 External	599.36
NEC CD-ROM 74 Multi-Media Bundle	619.32
NEC CD-ROM 74 Multi-Media Bundle	529.91
PANASONIC 1700SA External	2199.01
PANASONIC 1700SA External	2599.20

CD-ROM & OPTICAL DRIVES

SONY CDU-205N External CD-ROM	463.10
SONY CDU-545 Internal CD-ROM	279.10
SONY CDU-54101 Internal SCSI CD-ROM	419.32
SONY SMO-5501 500MB Erasable Optical	2098.42
TEKEL CD-ROM Int. 265 mms. Complete Kit	499.27
TEKEL CD-ROM Ext. 265 mms. Complete Kit	515.08
TEKEL Ext. 265 mms. Business Bundle Multi-Media	956.77
TEKEL Ext. 265 mms. Business Bundle Multi-Media	893.21
TEKEL Ext. 265 mms. Consumer Bundle 2 Multi-Media	568.77
TOSHIBA 3301 External	509.84

PLOTTERS, DIGITIZERS & SCANNERS

HURTA

KURTA 12 x 12 XLP/12 x 18 XLP	199.50/489.29
KURTA 12 x 17	538.27

CalComp

CALCOMP 12 x 12 w/16 Bit	279.52
CALCOMP 12 x 18 w/16 Bit	559.77
CALCOMP 2024/2036 Pacesetter	CALL
CALCOMP Classic 4036	CALL
CALCOMP Design Mate 3024	CALL

Summagraphics

Summagraphics Summa III 12 x 12	253.80
Summagraphics Summa III 12 x 18	519.80
Summa Grid III 18 x 24	1068.33

HOUSTON INSTRUMENTS

HOUSTON INSTRUMENTS DMP-61	3075.00
HOUSTON INSTRUMENTS DMP-161	2819.40
HOUSTON INSTRUMENTS DMP-162	2989.01

HEWLETT

HP7575 DXLHP/7576A EXL	3265.88/4168.25
HP7475A/HP7550B	1309.25/3009.70
HP 7475A/HP 7550B	6029.36
HP 7475A/HP 7550B	6999.30
HP 7475A/HP 7550B	724.10/2529.36
HP 7475A/HP 7550B	1439.10
EPSON S600C Color SCSI Scanner	837.99
EPSON S800C Color SCSI Scanner	1089.40

VGA & SUPER VGA MONITORS

MAGNAVOX Super VGA 1024 x 768 39mm	259.24
MAGNAVOX Super VGA 28mm 7CM9089	309.00
MAGNAVOX 17" 1024 x 768 14" VGA	109.50
MAGNAVOX 17" CM9217, 31mm	749.58
MAGNAVOX 17" 1024 x 768 14" VGA	1184.00
MAGNAVOX 17" 1024 x 768 14" VGA	919.28
MAGNAVOX 17" 1024 x 768 14" VGA	1069.50
NEC MultiSync 3FGX4FG	615.50/715.00
NEC MultiSync 5FG6FG	1247.93/2298.57
NEC MultiSync 2A	339.30
NANAO 17" 1280 x 1024 28mm FST	1109.39
PATENT 17" 1024 x 768 14" VGA	325.76
PATENT 17" 1024 x 768 14" VGA	379.86
PATENT 17" 1024 x 768 14" VGA	459.58
PATENT 17" 1024 x 768 14" VGA	272.98
SEIKO CM1760CR	999.15
SONY 1430 14" 1024 25mm Digital	599.95
SONY 1730/SONY 2030	CALL/CALL
VGA & SUPER VGA DISPLAY CARDS	
ATI Local Bus Pro 2 MB	509.49
ATI EISA GRAPHICS ULTRA Pro 2 MB	579.92
ATI GRAPHICS ULTRA 1+1 MB/2 MB	288.27/316.56
ATI GRAPHICS ULTRA Pro 1 MB/2 MB	426.97/496.62
ATI MCA GRAPHICS ULTRA Pro 2 MB	579.92
ATI GRAPHICS VANTAGE 1MB	174.34
ATI INTEGRA	79.36
ATI 8514 ULTRA 1MB	326.18
ATI VGA Wonder XL24 1 MB	143.23
DIAMOND Speedstar Pro Local Bus	142.28
DIAMOND Speedstar Pro VGA	138.84
DIAMOND Speedstar Double VEBA Local	173.89
DIAMOND Speedstar 24X 1 MB	117.80
DIAMOND Viper w/2MB	142.81
HERCULES Graphite 1 MB	274.29
ORCHID Prodesigner IIS 1 MB	145.45
ORCHID Farenheit 1280 LBS, 1MB	186.17
ORCHID Farenheit V 1MB 1280 x 1024	205.32
VIDEO 7 Win VGA 1MB	96.74</

This is one Local Bus you'll

Why settle for the bottleneck of slow video or sluggish hard drive performance?

With Insight's new VESA® Local Bus™ compatible system you don't have to.

These systems come standard with a 32-Bit VESA® Local Bus™ compatible video card and a 32-Bit VESA® Local Bus™ compatible IDE hard drive controller to give you top performance in both video and hard drive.

In fact, you can expect a 400% increase in hard drive performance. And video performance that's nearly double that of our nearest competitor.

With VESA video and hard drive, graphic intensive programs will pop onto your screen. And your numbers will crunch at awesome speed. How? Peripherals running from adapters on the CPU's local bus will run at full clock speed, rather than 8 or 12MHz as on a 16-bit ISA bus.

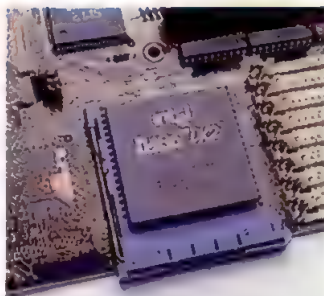
What's more, the Insight VESA® Local Bus™ is upgradable.

With our 238-pin ZIF (Zero Insertion Force) OverDrive™ socket for Intel's next generation processor based on the Pentium™ architecture, you'll keep current with the newest technology.

VESA

16-Bit

Comparison based on sequential read tests performed on a 16-bit controller and the new VESA Local Bus™ compatible IDE 32-bit controller.



Note the extra row of pin holes. That's for the upgrade to Intel's OverDrive™ based on the Pentium™ architecture!

The time is now to move up to Insight. According to PC Sources magazine, "A better balance of CPU hard drive and video throughput means better overall applications performance."

Why wait to break the information bottleneck? Call us today and we'll get you up to speed. Fast.

We're here 24 hours a day, seven days a week to help customize your system.

And you won't be left high and dry once the sale is complete. Your Insight 486 VL system comes with a 30-day "worry-free" money-back guarantee and a one-year Warranty/Replacement Policy.

Of course, we accept all major credit cards and offer leasing plans with low monthly payments.

Ask about the Insight Credit Card, too. It's convenient, no annual fee, no down payment, with low monthly payments.

Call now and see how affordable it is to "Buy the Super Direct™ Way".



never have to wait for.

Insight

Insight 486 VL Full Vertical

Fully upgradable Intel 80486 CPU
2 VESA® Local Bus™ compatible slots
4MB RAM - 128K Cache
250MB 12ms IDE Hard Drive
32Bit Local Bus™ compatible
IDE Controller
32Bit Local Bus™ compatible
1MB Graphics accelerator
Super VGA Card
14" Non-interlaced Super VGA
Color monitor
1.2MB 5.25" Floppy Drive
1.44MB 3.5" Floppy Drive

2 Serial Ports, 1 Parallel Port
Enhanced 101 Key Keyboard
MS-DOS 6.0
Mouse
Full Vertical Case
Free Lotus Works™ Software

486DX2-66MHz
\$2,299

as low as \$117/mo.

486-33MHz \$1,999
486DX2-50MHz \$2,199

FREE Lotus Works



Software!



Add these great values to your Insight or other PC system:

Insight 15" Monitor

A must for windows users! High resolution autoscans, 15" flat square anti-glare screen. Up to 1024 x 768, non-interlaced, .28mm dot pitch, detachable tilt and swivel base.

CM4000.....\$399

Talon TA-2000 Multimedia Kit

A complete, top-of-the-line multimedia kit including a Talon TA-200 CD-ROM drive:

- 280ms access time • Multispin • 64K buffer • 300KB transfer rate • Sound Blaster™ compatible sound board
- Amplified stereo speaker set • Stereo headphones • Installation manual • Free CD software- Toolworks Multimedia Encyclopedia, Software Jukebox, Guinness Disc of Records, The Animals, National Parks Guide, Sherlock Holmes and The Mayo Clinic Family Health Book.

ODTA2000MK.....\$699

Talon™ by Colorado 250MB internal tape backup

Standard QIC attaches to existing floppy controller.

2-3MB/minute, with data compression.

2 FREE tapes included.

TBTA250IK.....\$219

340MB Western Digital IDE Hard Drive

WD2340A, 12ms, 3.5", 1"H

Bare Drive Kit.....\$469

Upgrade from 250MB.....\$138

We're more
than Multimedia.
Call today for your



FREE Catalog
packed with over
20,000 products!

HARD DRIVES
International

(800) 755-9676

Insight

Insight Distribution Network, Inc.

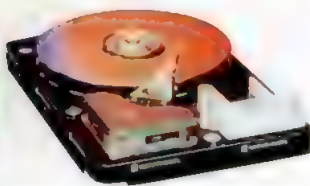
1912 W. 4th St., Tempe, AZ 85281

Local 602-350-1176

Fax 602-350-1150

The best place to buy drives to monitors

WESTERN DIGITAL



170MB	IDE	250MB	IDE
Western Digital WD2170A, 12ms 3.5" 1"H		Western Digital WD2250A, 12ms 3.5" 1"H	
Bare Drive Kit	\$259	Bare Drive Kit	\$329
16 Bit Kit	\$279	16 Bit Kit	\$349

210MB	IDE	340MB	IDE
Western Digital WD2200A, 12ms 3.5" 1"H		Western Digital WD2340A, 12ms 3.5" 1"H	
Bare Drive Kit	\$279	Bare Drive Kit	\$449
16 Bit Kit	\$299	16 Bit Kit	\$469

HARD DRIVES
International

"They know more about hard disks than any other salespeople I spoke with."

- PC Magazine



Talon

120MB	IDE
Talon TA3020A, 16ms 3.5" 1" H	
Bare Drive Kit	\$199
8 Bit Kit	\$239
16 Bit Kit	\$219

250MB	IDE
Talon TA3122A, 11ms 3.5" 1" H	
Bare Drive Kit	\$299
8 Bit Kit	\$339
16 Bit Kit	\$319

FUJITSU

420MB	IDE/SCSI	1080MB	SCSI
Fujitsu FJ2623A/S, 12ms 3.5" HH		Fujitsu FJ2266S, 14.5ms 5.25" FH	
Bare Drive Kit	\$779	Bare Drive Kit	\$1,299
16 Bit Kit (IDE)	\$799	16 Bit Kit	\$1,449
16 Bit Kit (SCSI)	\$929		

510/520MB	IDE/SCSI
Fujitsu FJ2624A/S, 12ms 3.5" HH	
Bare Drive Kit	\$789
16 Bit Kit (IDE)	\$809
16 Bit Kit (SCSI)	\$939

**Hard Drives,
Easy Install.**

BARE DRIVE KITS INCLUDE:

- Complete Mounting Kit (3.5" kits include 5.25" bezel)
- All Mounting Hardware (inc. screws)
- HDI's Hard Drive Reference Manual
- Step-by-Step Installation Instructions

FOR 8 BIT (PC/XT) KITS ADD:

- Controller (when applicable)
- Cable

FOR 16 BIT (286/386/486) KITS ADD:

- 1" to 1" Interleave Hard/Floppy Controller or Appropriate Interface
- Cable

Seagate

42MB	IDE	452MB	IDE
Seagate ST351A, 28ms 3.5" 1"H		Seagate ST3550A, 12ms 3.5" 1"H	
Bare Drive Kit	\$129	Bare Drive Kit	\$599
8 Bit Kit	\$169	16 Bit Kit	\$619
16 Bit Kit	\$149		

1000MB	SCSI
Seagate ST41200N, 12.9ms 5.25" FH	
Bare Drive Kit	\$1,049
16 Bit Kit	\$1,199

CONNER

170MB	IDE
Conner CP30174A, 17ms 3.5" 1"H	
Bare Drive Kit	\$259
16 Bit Kit	\$279

250MB	IDE
Conner CP30254, 12ms 3.5" 1" H	
Bare Drive Kit	\$389
8 Bit	\$429
16 Bit Kit	\$409

MICROPOLIS

660MB	SCSI	1050MB	IDE/SCSI
Micropolis MC1624, 15ms 5.25" HH		Micropolis MC2112A/S, 10ms 3.5" HH	
Bare Drive Kit	\$1,259	Bare Drive Kit	\$1,299
16 Bit Kit	\$1,409	16 Bit Kit (IDE)	\$1,319
		16 Bit Kit (SCSI)	\$1,449

Maxtor®

130MB	IDE	240MB	IDE
Maxtor MX7120A, 15ms 3.5" 1"H		Maxtor MX7245A, 15ms 3.5" 1"H	
Bare Drive Kit	\$239	Bare Drive Kit	\$329
16 Bit Kit	\$259	16 Bit Kit	\$349

**IF
YOU
DON'T
SEE
WHAT
YOU
NEED,
CALL!**

Here you see just a small sampling of the 20,000 computer products we carry day in and day out at our 100,000-square-foot distribution center.

But what you don't see is the trained staff of knowledgeable sales representatives who stand behind those products -- ready, willing and able to guide you through the selection process.

We call it solution selling. That means you can call us anytime - toll free, 24 hours a day, seven days a week, 365 days a year.

We'll assist you with the bewildering array of upgrade, hardware, and software options and send you exactly what you need, usually overnight via Federal Express.

Insight makes paying for your purchases just as easy. We accept all major credit cards and offer flexible leasing plans.

You can even use the Insight Credit Card. It's the convenient, no annual fee, no down, low monthly payment way to manage all your purchases through Insight. We'll even take your application by phone.

everything from hard is your telephone.

Call today for your FREE



catalog with over 20,000 products.

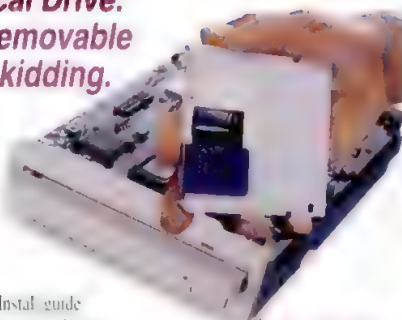
Fujitsu Magneto Optical Drive. Fully rewritable and removable storage for \$999. No kidding.

- Unlimited Storage!
- Newest Technology - 3.5" Disks
- 4 FREE Cartridges
- 100% Reliable - 100% Reusable

Kit Includes:

- M2511A Internal Drive
- 4 FREE 128MB Magneto Optical disk Cartridges
- Controller & Cabling
- Quick Install guide
- All necessary software
- All mounting hardware

M2511A.....



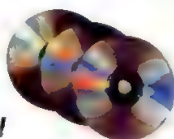
\$999 CD Software

Pick 5 for \$99*

Aircraft Encycl.
Am Bus Phone Book
The Animals
Barron's College Guide
Bible Library
Chessmaster MM
CIA/KGB Factbook
Electronic Home Library
Game Pack II
Great Cities (MM)
Interactive Storytime
Loom
Int'l Bus & Econ. Atlas
Mavis Beacon Typing
The Mayo Clinic Family
Health Guide
N. American Indians
Nat'l Parks Guide
Prescription Drugs Guide
Pixel Garden
Plant Doctor
Power Tools
Reference Library
Sherlock Holmes
Space-Apollo
Timetable Science
U.S. Atlas w/Automap
USA Factbook
USA Wars, Civil
USA Wars, Desert Storm
USA Wars: Korea
USA Wars: Vietnam

*FREE 128MB
purchase of a
Talon CD-ROM
drive or MM kit

CD-ROM



Ask about our multimedia kits!

Talon Deluxe TA-100

Internal, 380ms access time, 32K buffer, 150KB transfer rate, adapter, headphones and software. Photo CD compatible. CDTA100BK

\$269

Talon Deluxe

Internal, 375ms access time, 32K buffer, 150KB transfer rate, headphones and software. Photo CD compatible. CDTA150K

TA-150

\$299

Talon Deluxe TA200

Internal, 280ms multi-spin access time, 64K buffer, 300KB transfer rate, Photo CD compat., headphones and software. CDTA200BK

\$499

*Free with purchase of a Talon CD-ROM drive or MM kit.

New 1992 Toolworks Multimedia Encyclopedia

21 volume set. 33,000 articles w/3,000 pictures, 250 maps, 35 min. of video, 35 min. of sound and 55 video sequences.

Guinness Disk

The tallest man, the longest car. 7,000 record-breakers illustrated with over 300 photos and 70 sound clips!

Software Jukebox

Fly an F-117 Stealth with Jet Fighter! Three award-winning games for the price of one. Also includes 50 demos and Berenstain bears coloring program.

CD Stereo Speakers and Headphones

PortaPoint

The Mouse Alternative.

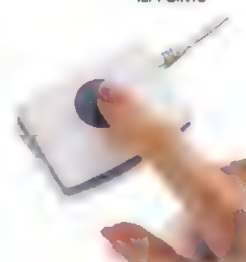
- Includes serial interface cable
- Optional 4 foot extension cable
- PS/2 adapter
- 3.5" DOS driver diskette (5.25" available)
- Quick-release Velcro® attachment
- One year limited warranty

PortaPoint advantages.

- Easy to install
- Weighs less than 1 ounce
- Never wears out
- No moving parts to clean or replace
- Approximate size of a matchbox

\$69

ILPPONT3



(800) 755-9676

And we won't leave you high and dry once the sale is complete. Our tech support is here 24 hours a day, and everything you buy from Insight comes with a 30-day "Worry-Free" money-back guarantee and a one-year warranty/replacement policy.

Call today for our free color catalog offering more than 20,000 products.

We understand that you want everything for your computer and you want it better, faster and cheaper. And with Insight, you don't need to go any farther than your phone to get it. That's the "Super Direct™ Way to Buy."

Try Insight. Call today. Or tonight. Or Sunday. Or any holiday. We're always here.

CIRCLE 164 ON READER SERVICE CARD

Insight

Insight Distribution Network, Inc.
1912 W. 4th St. Tempe, AZ
FAX (602) 902-1150
Local (602) 902-1176
National (800) 927-2907
International (602) 902-1145

Buy Smart. Buy Super Direct.

Super direct buying offers the brand name choices of a superstore with the value and convenience of direct marketing. You receive custom configured "plug and play" systems, overnight delivery, lifetime technical support, and flexible payment plans.



Lowest Price

You always get the lowest available price on PCs Compleat systems. We guarantee it for 30 days after your purchase.



Money Back Guarantee

We guarantee 100% satisfaction with a prompt replacement or refund. It's your choice within 30 days of purchase.



Overnight Delivery

Order any of our 100 standard configurations with overnight delivery by 4 P.M. E.T. weekdays and receive your system **tomorrow**.



Lifetime Toll-Free Support

Free technical support is available as long as you own your PCs Compleat system.



Custom Configuration

Eliminate installation hassles by letting PCs Compleat install extra memory, a modem, tape, or disk drive. Configuration is **FREE**.

Ask your sales consultant for complete details!



25 MHz 386SL

- 4MB RAM, expandable to 8MB
- 80MB hard drive
- 10" simultaneous VGA display
- MS-DOS, Windows 3.1, MS-Works, Prodigy, Mouse

Internal Fax/Modem \$299.99

Lease for \$53.18/mo.

\$1449



TOSHIBA

T1850

- 4MB RAM, expandable to 12MB
- MaxTime Power system

DOS, Windows		
Processor	DOS	Trackball
486SX25,80MB	\$1489	\$1569
486SX25,80MB Color	\$2099	\$2169
386SX25,120MB Color	\$2269	\$2349

Lease for \$54.65/mo.

\$1489



COMPAQ

Contura 3/25

- 25 MHz 386SL
- 4MB expandable to 12MB
- 64KB cache
- MS-DOS, Windows, Trackball

Display	Hard drive	Price
Mono	120MB	\$1599
Color	84MB	\$1999
Color	120MB	\$2149

Lease for \$58.68/mo.

\$1599



PowerExec EL Model 3

- 386SL/25 processor
- 4MB RAM, expandable to 8MB
- PCMCIA slot
- Trackball optional
- Requires hard drive

Model 3 w/Hard Drive	Price
80MB	\$1629
120MB	\$1799
200MB	\$1999

Model 123/W with 120MB Windows 3.1, Trackball \$1829

Lease for \$59.78/mo.

\$1629



TravelMate 4000

- 486 processor
- 10" display, 64 gray scale
- MS-DOS, Windows 3.1

Processor	RAM	Hard Drive	Price
486SLC/25	2MB	60MB	\$1639
486SLC/25	4MB	80MB	\$1719
486SX/25	4MB	120MB	\$1899
486DX/25	4MB	120MB	\$2399
486DX/25	4MB	200MB	\$2579
486DX2/50	8MB	200MB	\$2999

Lease for \$60.15/mo.

\$1639



PowerExec 3/25SL

- 386SL/25 processor
- 4MB RAM, expandable to 20MB
- 64KB cache, 2 PCMCIA slots
- MS-DOS

Screen	Hard drive	Model	Price
Mono	80MB	3	\$2009
Mono	120MB	123/W	\$2049
Active Color	200MB	203/W	\$3499

Lease for \$78.86/mo.

\$2009

PCs COMPLEAT



One Convenient Location.

PCs COMPLEAT

Real Service ♦ Unreal Prices

TOLL-FREE SALES

1-800-669-4727

COMPAQ HOTLINE

1-800-377-4727

Your Most Compleat PC Value.



LEADING EDGE

WinPro 486 E

- 4MB expandable to 32MB
- 8KB cache expandable to 256KB
- Windows Accelerator
- MS-DOS, Windows 3.1, MS-Works, MS-Productivity, Quicken

Processor	Drive	Price
486SX/33	130MB	\$1089
486SX/33	213MB	\$1169
486DX/33	130MB	\$1259
486DX/33	245MB	\$1369
486DX2/66	245MB	\$1549

Color VGA monitors from \$229.99

Lease for \$50/mo.

\$1089



LEADING EDGE

486 WinTower

- Upgradeable 486, 4MB RAM
- 1.44MB and 1.2MB floppy drives
- Local bus slot, 1MB video RAM

Processor	Hard Drive	Price
SX25	213MB	\$1259
SX33	130MB	\$1199
DX33	130MB	\$1379
DX33	213MB	\$1489
DX2/50	213MB	\$1599
DX2/66	213MB	\$1789

Color VGA monitors from \$229.99

Lease for \$50/mo.

\$1199



AST

Bravo Desktops

- 4MB RAM expandable to 64MB
- 120MB hard drive
- MS-DOS, Windows 3.1, MS Mouse

Processor	Model	Price
4/25s	213/33	\$1459
4/33		\$1819
4/50d		\$2199
4/66d		\$2269

Bundles include AST SVGA color monitor

Lease for \$50/mo.

\$1459



COMPAQ

DESKPRO/i 4/25is

- 25 MHz 486SX
- 4MB RAM
- 120MB hard drive
- 3.5" floppy drive
- QVision graphics controller
- Business audio
- MS-DOS, Windows 3.1, mouse

240MB configuration
\$1499

Compaq SVGA color monitor \$349.99

Lease for \$55.01/mo.

\$1499



COMPAQ

ProLinea 486DX2/50

- 4 MB RAM
- 3.5" and 5.25" floppy drives
- MS-DOS, Windows 3.1, PFS-Window Works
- Compaq mouse

Processor	Hard Drive	Price
486DX2/50	120MB	\$1529
486DX2/50	240MB	\$1729

Compaq SVGA color monitor \$349.99

Lease for \$56.11/mo.

\$1529



COMPAQ

DESKPRO/M

- 4 32bit EISA expansion slots
- Intelligent modularity
- QVision graphics controller
- MS-DOS, windows 3.1, mouse

Processor	RAM	Price
486SX25	4MB	\$2129
486DX33	4MB	\$2469
486DX2/66	8MB	\$3749

Compaq SVGA color monitor \$349.99

Lease for 78.13/mo.

\$2129



AST

Premium Desktops

- 8MB RAM expandable to 128MB
- 5 EISA slots, 5 drive bays
- 1.44MB 3.5" floppy drive
- Local bus, 1280x1024 resolution
- MS-DOS, Windows 3.1, MS mouse

Processor	Drive	Price
4/33	170MB	\$2579
4/66d	340MB	\$3329

AST SVGA color monitor \$429.99

Lease for \$94.64/mo.

\$2579



AST

Premium SE Server

- 10 EISA expansion slots
- SCSI backplane
- Integrated video 1280x1024

Processor	RAM/Drive	Model	Price
4/33	8MB/Optional	33	\$2629
4/50d	16MB/Optional	33	\$3649
4/66d	16MB/Optional	33	\$3799
4/66d	16MB/1GB	1003	\$5999

Lease for \$96.48/mo.

\$2629



\$59.99



\$79.99



\$24.99

*When ordered with a system

SPECTACULAR SAVINGS ON SOFTWARE!

PCs Compleat offers you spectacular savings—20% to 45% below market price—on popular software packages pre-installed on a system. Choose one or more of your favorite titles.

- | | | |
|--|--|---|
| <ul style="list-style-type: none"> ■ Lotus SmartSuite ■ Lotus 1-2-3 ■ Lotus AmiPro ■ Lotus Freelance Graphics ■ Lotus Organizer ■ Norton Utilities 7.0 Now! ■ Norton Antivirus ■ Norton Desktop Now! | <ul style="list-style-type: none"> ■ Norton pcAnywhere ■ Carbon Copy for Windows ■ WinFax PRO 3.0 ■ LapLink V ■ PFS:WindowWorks ■ PFS:Publisher ■ PFS:FirstChoice ■ PFS:Resume | <ul style="list-style-type: none"> ■ PFS:Prospect ■ Managing Your Money ■ Cathy Daily Planner ■ Farside Daily Planner ■ Trivial Pursuit Daily Planner ■ M.Y.O.B. ■ BestBooks ■ WinDings |
|--|--|---|

SOFTWARE SYSTEMS

Toshiba Direct.

Toshiba has been an industry innovator since its introduction of the first commercially accepted DOS-based portable in 1985. Always responsive to user demands for more power, lighter weight, and increased capabilities, Toshiba has introduced a broad range of technological innovations to the marketplace, including active matrix color technology. Toshiba active matrix color notebooks deliver up to 256 simultaneous colors at 640x480 resolution from a palette of up to 185,193 colors. Explore a full range of powerful, lightweight Toshiba notebooks and accessories implementing breakthrough technology, now available from your super direct source.



TOSHIBA

T4500

- 4MB RAM, expandable to 20MB
 - PC/MCIA slot
 - 6.4 lbs
 - MS-DOS, Windows, Trackball
- | Processor | Hard drive | Price |
|---------------|------------|--------|
| 186SX20 | 120MB | \$2589 |
| 186SX20 Color | 120MB | \$3799 |

Lease for \$95.01/mo.

\$2589



TOSHIBA

T4400C COLOR

- 25MHz 486SX
 - 4MB RAM, expandable to 20MB
 - 120MB hard drive
 - 9.5" active matrix color display
- \$3399
- 25MHz 486DX
 - 200MB configuration
- \$4099

Lease for \$124.74/mo.

\$3399



TOSHIBA

T6400

- 4 MB, expandable to 36MB
- Full 101-key keyboard
- One full-length expansion slot

Processor	Hard Drive	Price
486DX2 50-plasma	200MB	\$4049
486DX2 50-color	200MB	\$6049

Lease for \$148.59/mo.

\$4049

ACTIVE MATRIX COLOR DISPLAY



BRIGHTEST IN THE INDUSTRY



Toshiba MaxTime Power Management

MaxTime Power Management coordinates all hardware and software system elements to extend battery life. MaxTime allows Toshiba notebooks to operate in normal full power mode or in either of two standard power saving modes, or in a custom user-defined mode. In the power saving modes, select processing speed, display brightness and auto-off settings, and hard drive power down when not in use.

ExceptionalCare

All Toshiba notebooks are backed by ExceptionalCare warranty service. Get 48 hour turnaround for repairs or replacement. ExceptionalCare is available anywhere in the United States and in more than 20 international locations.

Desk Station IV

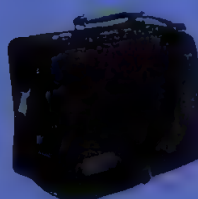
Turns the T3300, T4500, T4400 into a full function desktop

- 2 full size 16-bit expansion slots
- 1 5.25" half height drive bay
- Parallel, serial, PS/2 mouse, VGA monitor, 101-key keyboard ports
- 1 floppy disk drive port



Carry Case

- Full line of lightweight, durable carry cases
- Available in fabric or leather
- Contoured padded shoulder straps
- Pockets for diskettes, AC/auto adapters, extra batteries, and cables



COMPAQ, Toshiba, AST Now Available.



PowerExec 4/25SL

- 486SL/25 processor
 - 4MB RAM, expandable to 32MB
 - 8KB cache, 2 PCMCIA slots
 - MS-DOS, Windows 3.1, trackball
- | Screen | Hard drive | Model | Price |
|--------------|------------|-------|--------|
| Monio | 200MB | 2533W | \$2429 |
| Active Color | 200MB | 2533W | \$2429 |

Lease for \$99.05/mo.

\$2429

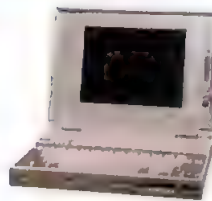


TravelMate 4000 Color

- 9.4" color display, 256 colors
 - Simultaneous VGA display
 - Microsoft Ballpoint trackball
 - MS-DOS 5.0, Windows 3.1
- | Processor | RAM | Hard Drive | Price |
|-----------|-----|------------|--------|
| 486SX/25 | 4MB | 120MB | \$2599 |
| 486DX/240 | 8MB | 200MB | \$3679 |

Lease for \$95.38/mo.

\$2599



LTE Lite/25E

- 25MHz 386SL
- 4MB RAM, expandable to 20MB
- 84MB hard drive
- 64KB cache
- Active matrix black and white display
- MS-DOS, Windows 3.1
- Built-in trackball

\$2839

- 120MB configuration

\$3029

Lease for \$104.19/mo.

\$2839



No Hidden Charges

We don't add credit card surcharges, software/hardware installation fees, or inflated delivery charges. There's never a restocking fee.



Low-Cost Leases

Business accounts may lease with 100% financing for up to 60 months. Leasing covers all hardware, peripherals, software and accessories.



Software Installed Free

Avoid the time and hassle of installing software. Software ordered with your system is installed for free.



2nd Day Delivery

Place your standard order by 4 P.M. E.T. and receive it in two business days for only \$19.95 per package. Guaranteed.

Ask your sales consultant for complete details.

FORM 670A



LTE Lite/25C

- 25MHz 386SL
- 4MB RAM, expandable to 20MB
- 84MB hard drive
- 64KB cache
- Active matrix color display
- MS-DOS 5.0, Windows 3.1
- Built-in trackball

\$2999

- 120MB configuration

\$3589

Lease for \$110.06/mo.

\$2999



Panasonic

KX-P11241

- 24 pin dot matrix printer
- Wide carriage
- 12 cps

\$329.99

KX-P2624

- 300 cps model

\$359.99

\$329.99



Megahertz Fax/Modems for Notebooks

- V.42/V.42bis
- MNP 5
- Hayes compatible
- 5 year warranty

Notebook	Data/Fax	Model	Price
Toshiba	2400	1200EM	\$269.99
PCMCIA	2400	1200EM	\$289.99
Toshiba	9600	1200EM	\$389.99
PCMCIA	9600	1200EM	\$409.99
Toshiba	14400	1200EM	\$429.99

Modems also available for Compaq & Texas Instruments starting at \$209.99

\$209.99

90 DAYS FREE FINANCING

- ✓ 90 days FREE financing—No interest if paid within 90 days*
- ✓ No application fee.
- ✓ No annual fee.
- ✓ Provides additional available credit
- ✓ Same day credit approval
- ✓ Convenient monthly payments

Sales Hours:

Monday-Friday
9 A.M.-9 P.M. E.T.
Saturday 10 A.M.-6 P.M.
Sunday Noon-6 P.M.

PCs COMPLEAT

Real Service ♦ Unreal Prices

TOLL-FREE SALES

1-800-669-4727

COMPAQ HOTLINE

1-800-377-4727



*Subject to credit approval by Monogram Credit Card Bank of Georgia. Except in CO, IA, ME, WI, finance charges will be assessed at a variable monthly periodic rate that is based on a corresponding variable annual percentage rate equal to the greater of (A) 21.84% ANNUAL PERCENTAGE RATE and (B) the sum of (i) the prime rate as published in The Wall Street Journal in its "Money Rates" section on the last business day of each calendar month, plus (ii) 13.5%, in each case, subject to a minimum FINANCE CHARGE of \$ 50 (except in certain states). Under this formula, as of July 31, 1992, the monthly periodic rate was 11.82% and the corresponding ANNUAL PERCENTAGE RATE was 21.84%. In CO, IA, ME, WI, and WI the monthly periodic rate will be 1.5% which is a corresponding ANNUAL PERCENTAGE RATE of 18%. If purchases are paid in full within 90 days of the purchase date, the account will be credited for all finance charges and insurance charges that accrued on such purchases during such period. Thereafter, finance charges will commence at the applicable rate noted above.

CIRCLE 268 ON READER SERVICE CARD

expotech

**We give you
more power...
more service...
more support...
more value...
all for less!**

Everything Included

At Expotech we believe you should get everything you need the first time you buy your computer. Therefore, Expotech gives you a true windows accelerator with true 16.7 million color capability; plus, a 2400/9600 baud send receive fax modem; plus a large hard drive; plus a non-interlaced .28 dot pitch monitor and much more.

- Windows Accelerator Included
- 2400/9600 Send/Receive Modem/Fax
- Upgradable
- Software Pre-Loaded



Complete Testing

All Expotech components are tested for 24 hours before they are assembled and then the completed Expotech computer is burned-in again before shipping. Plus, all system software, including windows is preloaded. Therefore you can unpack the box, plug in the cables, and start computing.

Unsurpassed Quality

Expotech manufacturers motherboards, cases, keyboards, and even the chip sets. The components Expotech purchases come from the highest quality vendors available like Seagate and Intel. All Expotech systems are **FCC Class B...Novell certified...Windows compatible...and Optimized for speed.**



Remote Diagnostics

allows a trained Expotech technician to access your computer via modem and diagnose hardware and software problems. We can even fix most software or CMOS problems while you watch. Plus, Expotech maintains a bulletin board that lets you download the latest software drivers for your hardware. Let Expotech supply you with the computer for today's work and tomorrow's opportunities.

Options

- * 260 Meg hard drive
- * Ram upgrades
- * Works for Windows
- * Publish it
- * CD Rom package

Software, Modem & Service Package for Desktop & Tower Systems Only. All Prices, Availability, and Specifications subject to change without notice. Please call to confirm pricing, IL Sales Tax, Availability, and Warranty Details. The Intel inside Logo is a trademark of Intel Corporation.



expo 486sx/33

- Accelerated Local Bus
- Desktop Metal Case, 33Mhz
- 1 Mb super VGA Video w/Windows Accelerator and displays 16.7 Million colors
- 1.2 Meg Floppy, 1.44 Meg Floppy
- 102 Key Keyboard
- 14" Super VGA .28 Non Interlaced Monitor
- Multi I/O (2 Serial, 1 Parallel, 1 Game Port)
- MS-DOS 6.0, Windows 3.1, Hi-Res Mouse
- Commute Remote Diagnostic Software
- Anti-Virus Software
- 2400 Baud Modem w/Send-Receive Fax
- 4 Mb RAM, 210 Meg Seagate Hard Drive

JUST \$1329
25 Mhz only \$1249

1.800.284.3976
in Canada 1.800.685.8284





expo 486dx/33

- Accelerated Local Bus
- Desktop Metal Case, 128K Cache, 33Mhz
- 1 Mb super VGA Video w/Windows Accelerator and displays 16.7 Million colors
- 1.2 Meg Floppy, 1.44 Meg Floppy
- 102 Key Keyboard
- 14" Super VGA .28 Non Interlaced Monitor
- Multi I/O (2 Serial, 1 Parallel, 1 Game Port)
- MS-DOS 6.0, Windows 3.1, Hi-Res Mouse
- Commute Remote Diagnostic Software
- Anti-Virus Software
- 2400 Baud Modem w/Send-ReceiveFax
- 4 Mb RAM, 210 Meg Seagate Hard Drive

JUST \$1599

1.800.284.3976
in Canada 1.800.685.8284



expo 486dx2/66

- Accelerated Local Bus
- Desktop Metal Case, 128K Cache, 33Mhz
- 1 Mb super VGA Video w/Windows Accelerator and displays 16.7 Million colors
- 1.2 Meg Floppy, 1.44 Meg Floppy
- 102 Key Keyboard
- 14" Super VGA .28 Non Interlaced Monitor
- Multi I/O (2 Serial, 1 Parallel, 1 Game Port)
- MS-DOS 6.0, Windows 3.1, Hi-Res Mouse
- Commute Remote Diagnostic Software
- Anti-Virus Software
- 2400 Baud Modem w/Send-Receive Fax
- 4 Mb RAM, 210 Meg Seagate Hard Drive

JUST \$1899
DX 250 only \$1749



CIRCLE 305 ON READER SERVICE CARD

expotech

*A New Level of
Service and Support!*

24 Hour Tech Support

Toll Free Technical Support Available
24 Hrs a day 7 days a week.

Remote Diagnostics

On-Site Modem Diagnostics.

Anti-virus Software

Anti-Virus Software included.

Same Day Shipping

Base System models in stock
ordered before 11am CST,
Can be shipped same day
after Credit approval.

One year on-site service

Have your computer repaired
at your site.

Next day parts replacement

Replacement parts sent
24 Hour Express.

30 Day parts replacement

Full refund if you are not satisfied in
the first 30 days after shipment.

Built-in 2400 baud fax/modem

2400/9600 Send Recieve Fax
Modem Included with every
EXPO Tech Desktop System.

Bulletin board service

Download Drivers and Talk
to techs on line.

No surcharge on credit cards

We accept Visa, Mastercard, and
Discover

Leasing available

Leasing available to qualified buyers.

Purchase orders accepted

COD and terms for qualified
customers.

Open 7 days a week

Central Standard Time
Monday - Friday 7am - 8:30pm
Saturday 9am - 6pm Sunday 10am - 3pm

expotech

113 McHenry Road
Buffalo Grove, IL 60089

1.800.284.EXPO

FAX 1.800.947.EXPO

GOVERNMENT & EDUCATION 1.800.947.5461

CANADA 1.800.685.8284

PRINTERS

LEXMARK

Laser Printer 6/10	\$1,189 / \$1,259
Laser Printer E / SE	\$749 / \$919
Laser Printer 6P	\$1,359
Laser Printer 10L / 10P	\$1,499 / \$1,749
Dot Matrix 2380 / 2381	\$325 / \$455
Dot Matrix 2390 / 2391	\$325 / \$455
4079 Thermal Color Jet w/Postscript	\$2,499
4070 Ink Jet w/ sheet feeder	\$335 / \$375
4226 High Speed Dot Matrix	\$1,299
Portable, AC adapt. battery, blk or wht	\$345

EPSON

Action Printer 3250	\$189
Action Laser Printer 1000 512K	\$619
Action Laser Printer 1500	
1MB/2MB (NEW)	CALL / \$729
Stylus 800 Ink Jet	CALL
LX 810	\$169
FX 870 / 1060 / 1170	\$265 / \$345 / \$345
LQ 570- NEW! / 870	\$235 / \$425
LQ 1070 / 1170	\$345 / \$579
LQ 2550	\$875
EPL 8000	\$859
DFX 5000 / 8000	\$1,269 / \$2,139

Panasonic

KX-P 2123 / with Color Kit	\$229 / \$279
KX-P 2124 / with Color Kit	\$299 / \$349
KX-P 2634	\$359

star PC

NX-1001 Multifont	\$135
NX-1040 Rainbow NEW	\$159
NX-2420 Rainbow	\$269
NX-2430 Black	\$215
Star Jet 48	\$285
LS-LaserPrinter (toner cartridge extra	
5 / SEK / STT	\$615 / \$749 / \$979

NEC

\$250 rebate on these NEC printers through 6/30/93	
Silentwriter M95, 6ppm Postscript	\$1249
Silentwriter M95X (M95 but with fax)	\$1449
Silentwriter M97, 10ppm Postscript	\$1489
Silentwriter M97X (M97 but with fax)	\$1729

MODEMS

LOWER PRICES!

ZOOM

Zoom AMC 2400 Internal with RPI	\$45
Zoom AMX 2400 External with RPI	\$59
Zoom AFC 2400 Send/Rec 48 RPI Int.	\$59
Zoom AFZ 2400 Send/Rec 48 RPI Ext.	\$69
Zoom FC 2400 Send/Rec 9600 Internal	\$69
Zoom FX 2400 Send/Rec 9600 External	\$89
Zoom/FaxServer	\$205
Zoom V.32 bis Send/Receive for Windows Internal / External	\$175 / \$205
Zoom V.32 bis Send/Receive 14,400 Internal / External	\$175 / \$205
PKT Portable, S/R Fax Modem	\$80

Supra Corporation

SupraFaxModem Internal 24/96 NEW!	\$63
Supra 2400 Internal w/ Mirror II	\$39
Supra 2400 External	\$59
SupraFaxModem 144LC, Class 1 only	
External DOS / Windows	\$109 / \$199
SupraFaxModem V.32 bis, Internal with FaxSoftware DOS/Win	\$179 / \$179
SupraFaxModem V.32 bis, Ext. alone	\$225
with Fax Software, DOS	\$239
with Fax Software for Win	\$239
with Fax Software for Mac	\$275

SCANNERS

LOGITECH

Deco Scanner with Catchword	\$95
Scanman Model 256 (gray scale)	\$235
Scanman 256 w/Catchword Pro	\$265
Scanman Color	\$325
PhotoMan	Call

info

480 DPI Hand Scanner for Windows with Interpreter Windows OCR Software	\$79
800 DPI Hand Scanner (DOS or Win)	\$129
Page Reader, 300 DPI full pg for Win	\$349

EPSON

EPS 600C Parallel / SCSI	\$779 / \$819
EPS 800C	\$1,075

MONITORS

Panasonic

Panasonic C13811, 28 DP, 1024 x 768	\$299
Panasonic C1395, Non-Interlaced 28 DP, 1024 x 768	\$419

CTX

468A, 14", 28DP/1024x768, Inter	\$269
468B, 14", 28DP/1024x768	\$305
Non-Interlaced	
1560, 15", 28DP/1024 x 768, NonInterl	\$449
1760LC, 17" Flat, 31DP, 1280x1024, Non-Glare, Non-Interlaced	\$775

SONY

CPD 1325 UC2, 14", 640 x 480 VGA, 15 MM, includes Cables & Stand	\$329
CPD 1438S 14" 1024 x 768, non-interl.	\$619
8514A, 25 MM, cables & stand	
CPD 1738, 17", 1024 x 768, non-interl.	
8514A, 25MM, cables & stand	
FREE DELIVERY	\$1,069

NEC

MultiSync	
3F6E 15" 28 1024x768 60Hz	\$599
4F6E 15" 28 1024x768 76Hz	\$689
5F6E 17" 28 1024x768 76Hz	\$1,069
5F6E 17" 28 1280x1024 74Hz	\$1,249

NETWORKING

LANTastic by

ARTISOFT

AE/2T Ethernet Adaptor	\$193
AE-2 Ethernet Starter Kit/Adaptor	\$445/\$193
AE-2 Windows Starter Kit	\$459
AE-3 ISA Starter Kit/Adaptor	\$315/\$225
AE-3 Windows Starter Kit	\$579
2 Mbps Starter Kit/Adaptor	\$319/\$128
2 Two Station Kit	\$81
Artisoft Central Station	\$379
Lantastic Voice Adaptor	\$95
Network Eye	\$108
Lantastic for Windows/Network	\$158/\$263
AE-2 Ethernet Software	\$84
Articom / A / V 4.1	\$215/\$57
NewMedia Kit - FREE DELIVERY	\$479
NetBasket (12AE-2 or AE 2T)	
FREE DELIVERY	\$1,979
Node Runner 2000C or 2000TP	\$169
6 Pack / 12 Pack	\$879 / \$1,889
Node Runner 2000A combo	\$215
LANtastic 2000C Starter Kit V.5.0	
DOS / Win	\$449 / \$519

3Com

Etherlink II TP, 8 Bt (3C503B-TP)	\$189
5 Pack, FREE DELIVERY	\$919
Etherlink II 8 Bt (3C503R)	\$185
5 Pack, FREE DELIVERY	\$919
Etherlink II 16 Bt 8/16 Bt (3C50-16TP)	\$179
5 Pack, FREE DELIVERY	\$739
Etherlink II 16 Bt 8/16 Bt (3C503-16)	\$155
5 Pack, FREE DELIVERY	\$719
Etherlink 16, 16 Bt (3C507)	\$275
5 Pack, FREE DELIVERY	\$1,289
Etherlink 16 TP, 16 Bt (3C507-TP)	\$295
5 Pack, FREE DELIVERY	\$1,429
Etherlink III 10BT	\$129
5 Pack, FREE DELIVERY	\$599
Etherlink III	\$129
5 Pack FREE DELIVERY	\$599
LinkBuilder FMS Management Module	
FREE DELIVERY	\$589
LinkBuilder FMS TP Hub FREE DEL	\$729
LinkBuilder FMS Coax Hub FREE DEL	\$1,439
Tokenlink III 16/4 Bt ISA FREE DEL	\$539
Tokenlink III 16/4 Bt EISA, FREE DEL	\$729

NOVELL / EAGLE / SMC XIRCOM / GATEWAY / INTEL THOMAS-CONRAD Call for Details!

HARD DRIVES

Seagate

All Seagate Drives include: Universal Installation Manual, AT Rats & Cable

ST-251-1 MFM	42 MB	28MS	\$239
ST-315A IDE	42MB	28MS	\$135
ST-3120A IDE	106 9MB	16MS	\$179
ST-3144A IDE	130 7MB	19MS	\$199
ST-3243A IDE	214MB	16MS	\$275
ST-3283A IDE	245MB	12MS	\$315
ST-3283N SCSI	245MB	12MS	\$339
ST-3385A IDE	341MB	12MS	\$459
ST-3350A IDE	FREE DELIVERY		\$569
ST-3600A IDE	FREE DELIVERY		\$899

Maxtor

IDE 7120 / 7170	\$209 / \$255
IDE 7213 / 7245	\$289 / \$305
IDE 7345	\$479
SCSI 7120 / 7213	\$219 / \$329
SCSI 540SL - FREE DELIVERY	\$909
SCSI 1240S - FREE DELIVERY	\$1,559

CONNER

CP30084E / CP30104H IDE	\$185 / \$205
CP30174E / CP30204 IDE	\$239 / \$309
CP30254 IDE	\$335
CP30808E SCSI	\$189
P30170E SCSI	\$255
CP30200 SCSI	\$325

Quantum

ELS 42 IDE / SCSI	\$139 / \$165
ELS 85 IDE / SCSI	\$185 / \$189
ELS 127 IDE / SCSI	\$239 / \$255
ELS 170 IDE / SCSI	\$259 / \$289
LPS 240 IDE / SCSI	\$325 / \$345
LPS 525 IDE / SCSI FREE DEL	\$925 / \$999

Plus

Development

Hardcat II XL 50 / 105	\$199 / \$255
Hardcat EZ 42 / 85	\$199 / \$239
Hardcat EZ 127 / 240	\$309 / \$519

MICROPOLIS

FREE DELIVERY in the contiguous 48 states	
1528 SCSI	1334MB FH \$1679
1548 SCSI-2	1748MB FH \$1879
1588 SCSI	667 8MB FH \$1149
1598 SCSI-2	1034 5MB FH \$1429
1624 SCSI-2	688MB HH \$1129
1684 SCSI	340MB HH \$1059
1908 SCSI-2	1408MB FH \$1869
1924 SCSI-2	2100MB FFH \$2179
1936 SCSI-2	3020MB FH \$3449
2108 SCSI	698MB FH \$1299
2112A IDE	1050MB HH \$1249
2112 SCSI-2	1050MB HH \$1249

FLOPTICAL

SYSGEN

SUPER 21MB External	
Includes 8 bit host adaptor and software	\$379
VALUE STOR 21MB Internal	
Includes 3 3 1/2" drive, 8 bit SCSI host adaptor, cable & software	\$309

REMOVABLE

ByQuant

BARE DRIVES	
Syquest 555, 44MB Internal	\$269
Syquest 5110C, 88MB Internal (new Reads & Writes 44MB & 88MB)	\$389
Media Cart, 44MB / 88MB	\$99/99
44MB KITS with Interface	
8 bit / media cartridge, Int/Ext	\$359/439
88MB KITS with Interface	
features Syquest's new 5110C removable cartridge drive - reads & writes	
44MB & 88MB	
8 bit w/media cartridge Int/Ext	\$519/599
16 bit w/media cartridge Int/Ext	\$599/709

FLOPPY

SONY

FLOPPY DRIVES

3 1/2" without Frame 1 44MB PC/AT \$55

Canon

All Media Floppy

The All-In-One 3.5" & 5.25"

Half Height Internal Floppy Drive

\$139

Supports 5.25", 360K/1 2MB as well as 3 1/2", 720KB/1 44MB formats. Any AT computer with a single 5.25", half height bay can accommodate the AMF. Uses a standard floppy interface

TAPE BACK UP

COLORADO

MEMORY SYSTEMS INC.

JUMBO - Low Cost Tape Backup

DJ10-120MB	\$145
Adaptors AB11 External	\$37
KE10 External	\$109
DJ20-250MB	\$195
Adaptors FC10 Internal	\$79
KE10 External	\$109

JUMBO TRAKKER

External Parallel Printer Port Tape Backup System:

JT10(40-120)	\$335
JT20 (80-250)	\$395

INCLUDES: external tape drive, easy-to-use tape backup software, data cable, AC Power adaptor and manuals.

POWERTAPE SYSTEM:

includes Colorado Backup for DOS software 2GB /4GB FREE DELIVERY \$999 / \$1,549

POWER SUPPLY

TRIPLITE

BC Series Standby UPS Systems

BC 250 250 VA, 2 outlet	\$99
BC 400 400 VA, 2 outlet	\$155
BC 500 500 VA, 4 outlet	\$179
BC 500LAN 500 VA, 4 outlet, LAN inter	\$189
BC 600LAN 600VA, 4 outlet, LAN inter	\$245
BC 750LAN 750 VA, 4 outlet, LAN inter	\$299
BC 900LAN 900 VA, 4 outlet, LAN inter	\$345
BC 1250LAN 1250 VA, 4 outlet,	
2 ms switching, LAN interface	\$479
Omnipower Line Interactive UPS - corrects brownouts -	
OMNI 450LAN 450 VA	\$269
OMNI 600LAN 600 VA	\$349
OMNI 750LAN 750 VA	\$429
OMNI 900LAN 900 VA	\$489
OMNI 1250LAN 1250 VA	\$629

Back Ups

250; LAN nodes, 386SX, 286 systems, Internet hardware, POS	\$99
400; desktop 386, 486 systems, 286 servers	\$159
450; lower 386, 486 systems, servers	\$189
600; heavily configured systems, CAD/CAM workstations	\$259
900; multiple systems, longer runtime applications	\$369
1250; multiple systems, longer runtime, telecom, mins	\$489

Smart Ups

400, 286, 386 desktop syst. & servers	\$299
600; lower-type servers and engineering workstations	\$389
900; CAD/CAM, engineering workstations, and servers	\$559
1250; multiple servers, telecom equipment	\$729
2000; minicomputers, multiple servers	\$1,299
FREE DELIVERY	
Powerchute Software for Unix	\$94
Powerchute Plus - Novell	\$69

CONTROLLERS

Seagate

ST-01 SCSI 8 Bt Adaptor	\$29
ST-02 SCSI 8 Bt Adaptor w/FD Control	\$45
ST-07 IDE Controller Hard Drive Only	\$29
ST-08 IDE Controller - HD & Floppy	\$39
ST-11R RLL 8 Bt Controller	\$51

Gadaptec

1522 SCSI Direction Kit, 16 Bt Standard SCSI with Floppy Support & Drivers	\$149
1522 SCSI Direction PLUS Kit	\$195
1542C Single	\$199
1542C SCSI Master Kit	\$259
1542C SCSI Master PLUS Kit	\$329

FUTURE

1680 SVP-ISA, 16 bit SCSI 2 w/floppy support & CD ROM SCSI support	\$129
--	-------

COREL

SCSI Software

Allows the connection of up to 7 SCSI peripherals to a single host adapter \$84.95

VIDEO BOARDS

DIAMOND

Speedstar 24X 1MB 24bit, 1280x1024x1555	
Stealth 1MG, 32,000 col, 1024x768	\$215
Stealth 24, ISA / VLB	\$165/\$165
Stealth Pro, ISA / 1MB / 2MB	\$245/\$355
Stealth Pro, VLB 1MB / 2MB	\$245/\$339
Viper VLB 1MB / 2MB	\$315 / \$399

The World's Ultimate Superstore

Voice: 508-443-6125

日本の皆様よりのオーダー大歓迎！ 日本国でFAX:0011-508-443-8615
又は、コンピューターサービスナンバー 1.D.70007,1534
で皆様よりのオーダーをお待ち申し上げております

City Streets



maps. Will be your address finder, route planner, distance calculator and custom map maker. Ideal for anyone who uses maps for marketing, sales, real estate, deliveries, presentations, research, newsletters, education, fund-raising and dozens of other purposes.

Publisher: Read Scholar

\$59

BOOTCON



Eliminates compatibility problems by allowing you to quickly choose your computer configuration from a menu during each boot. With **BOOTCON** you can easily have different configurations for Windows, CD-ROMs, networks, and scanners. Now you can have configurations that are optimized for the different

types of hardware and software you use. Also supports using passwords for the system, or for particular configurations. Fully compatible with DOS 3.1-6.0, Windows, Stacker, OEMM, and 386MAX.

Publisher: Modular Software

\$59

Auto Insight



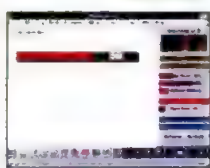
Take an incredible journey through the inner workings of the automobile with **Auto Insight**. This extraordinary learning tool lets you explore the fascinating complexities of a car—in amazing graphic detail. From bumper to bumper, **Auto Insight** will guide you pictorially through every system in the car.

Thorough descriptions are hyperlinked to colorful illustrations, clearly identifying parts, components and their individual importance. Put it in drive and take an exciting spin through **Auto Insight!**

Publisher: Informative Graphics

\$41

WinProbe



Now, you can quickly and easily optimize and troubleshoot Windows operations with **WinProbe** from Landmark. The tune-up feature uncovers the

secrets to faster and more efficient Windows operations optimizes and frees memory WinProbe performs full system diagnostics. In addition, it analyzes IRQ, DMA and UMB which makes installation of an add-in card a snap WinProbe is bundled with PC Certify DOS diagnostic and Landmark Speed Test for Windows

Publisher: Landmark

\$60

Volante Wary 10 Plus



Very high performance WINDOWS/CAD accelerator board featuring the S3 86C801 graphics engine. Supports 16 colors at 1280 x 1024

and 1152 x 900, 256 colors at 1024 x 768, 65,536 colors at 800 x 600, and 16.7 million colors at 640 x 480. Standard with feature connector for multi-media capture devices. Vertical refresh to 70 Hz, horizontal scan to 65 kHz.

Publisher: National Design

\$179

Communications PAK for Windows



Solves all your communication needs by including WinFax PRO 3.0, CrossTalk for Windows and SuperStar PRO in one economical package. WinFax PRO 3.0 transforms your PC into a fax/modem for

your PC into a send/receive fax machine and makes sending faxes as easy as printing a document. Features like annotating documents on screen, conversion of incoming faxes into editable documents via state-of-the-art OCR, flexible document management capabilities and multiple phone books for broadcast faxing puts the best fax technology at your fingertips. **CrossTalk for Windows** enables you to view and retrieve information from on-line services such as CompuServe and MCI Mail through easy to use buttons and icons. **\$149**

Publisher: Delrina

\$149

Orders accepted on our toll free number Mon-Sat 8:30 to 5:30 EST. Visa, MasterCard, and DiscoverCard accepted. All credit card orders processed within 24 hours. Continental US shipments: UPS Ground \$5, Airborne Overnight \$7. Corp, Gov't, Educ, APO, FPO, International orders accepted. No sales tax except for Mass add 5%. Personal checks will delay shipment 5 business days. Products covered by manufacturer's guarantee. Defective software replaced immediately. No CODs. Item availability and price subject to change without notice. 15% restocking fee for non-defective returns.

CIRCLE 177 ON READER SERVICE CARD

Here are only a few of the 9,000 products we stock for our satisfied customers. Just call 1-800-228-7449 to start saving time and money with Computer Express. Computer Express 31 Union Ave. Sudbury, MA 01776

[illegible]

LIFETIME*
WARRANTY
100%
GUARANTEED

MEMORY SUPER SOURCE

1x9 \$36
SIMMS
4x9 \$145
CALL FOR LATEST SIMM PRICES

HARD
DRIVE
SUPER
PRICES
\$CALL

FAST
DELIVERY,
GREAT
SERVICE
AND
LOW
PRICES

MATH CO-PROCESSORS

INTEL	CYRIX	80387
80387-100MHz	80387-100MHz	80387-100MHz
80387-133MHz	80387-133MHz	80387-133MHz
80387-166MHz	80387-166MHz	80387-166MHz
80387-200MHz	80387-200MHz	80387-200MHz
80387-266MHz	80387-266MHz	80387-266MHz
80387-333MHz	80387-333MHz	80387-333MHz
80387-400MHz	80387-400MHz	80387-400MHz
80387-500MHz	80387-500MHz	80387-500MHz
80387-600MHz	80387-600MHz	80387-600MHz
80387-800MHz	80387-800MHz	80387-800MHz
80387-1000MHz	80387-1000MHz	80387-1000MHz

SIMM-SIPP MODULES

1MB X 9-70NS SIMM	256K X 9-100NS SIMM	1MB X 9-70NS SIPP
145	145	145
145	145	145
145	145	145
145	145	145
145	145	145
145	145	145
145	145	145
145	145	145
145	145	145
145	145	145
145	145	145

Quantum
FUJITSU
Maxtor
Seagate
MICROPOLIS
CONNER
WESTERN
DIGITAL

Apple

AT&T

AT&T 100MHz	100
AT&T 133MHz	133
AT&T 166MHz	166
AT&T 200MHz	200
AT&T 266MHz	266
AT&T 333MHz	333
AT&T 400MHz	400
AT&T 500MHz	500
AT&T 600MHz	600
AT&T 800MHz	800
AT&T 1000MHz	1000

EPSON

EPSON 100MHz	100
EPSON 133MHz	133
EPSON 166MHz	166
EPSON 200MHz	200
EPSON 266MHz	266
EPSON 333MHz	333
EPSON 400MHz	400
EPSON 500MHz	500
EPSON 600MHz	600
EPSON 800MHz	800
EPSON 1000MHz	1000

AST

AST 100MHz	100
AST 133MHz	133
AST 166MHz	166
AST 200MHz	200
AST 266MHz	266
AST 333MHz	333
AST 400MHz	400
AST 500MHz	500
AST 600MHz	600
AST 800MHz	800
AST 1000MHz	1000

COMPAQ

COMPAQ 100MHz	100
COMPAQ 133MHz	133
COMPAQ 166MHz	166
COMPAQ 200MHz	200
COMPAQ 266MHz	266
COMPAQ 333MHz	333
COMPAQ 400MHz	400
COMPAQ 500MHz	500
COMPAQ 600MHz	600
COMPAQ 800MHz	800
COMPAQ 1000MHz	1000

ALR

ALR 100MHz	100
ALR 133MHz	133
ALR 166MHz	166
ALR 200MHz	200
ALR 266MHz	266
ALR 333MHz	333
ALR 400MHz	400
ALR 500MHz	500
ALR 600MHz	600
ALR 800MHz	800
ALR 1000MHz	1000

HP

HP 100MHz	100
HP 133MHz	133
HP 166MHz	166
HP 200MHz	200
HP 266MHz	266
HP 333MHz	333
HP 400MHz	400
HP 500MHz	500
HP 600MHz	600
HP 800MHz	800
HP 1000MHz	1000

SUN

SUN 100MHz	100
SUN 133MHz	133
SUN 166MHz	166
SUN 200MHz	200
SUN 266MHz	266
SUN 333MHz	333
SUN 400MHz	400
SUN 500MHz	500
SUN 600MHz	600
SUN 800MHz	800
SUN 1000MHz	1000

DELL

DELL 100MHz	100
DELL 133MHz	133
DELL 166MHz	166
DELL 200MHz	200
DELL 266MHz	266
DELL 333MHz	333
DELL 400MHz	400
DELL 500MHz	500
DELL 600MHz	600
DELL 800MHz	800
DELL 1000MHz	1000

OKIDATA

OKIDATA 100MHz	100
OKIDATA 133MHz	133
OKIDATA 166MHz	166
OKIDATA 200MHz	200
OKIDATA 266MHz	266
OKIDATA 333MHz	333
OKIDATA 400MHz	400
OKIDATA 500MHz	500
OKIDATA 600MHz	600
OKIDATA 800MHz	800
OKIDATA 1000MHz	1000

ZENITH

ZENITH 100MHz	100
ZENITH 133MHz	133
ZENITH 166MHz	166
ZENITH 200MHz	200
ZENITH 266MHz	266
ZENITH 333MHz	333
ZENITH 400MHz	400
ZENITH 500MHz	500
ZENITH 600MHz	600
ZENITH 800MHz	800
ZENITH 1000MHz	1000

RAM

RAM 100MHz	100
RAM 133MHz	133
RAM 166MHz	166
RAM 200MHz	200
RAM 266MHz	266
RAM 333MHz	333
RAM 400MHz	400
RAM 500MHz	500
RAM 600MHz	600
RAM 800MHz	800
RAM 1000MHz	1000

EXPANSION BOARDS

EXPANSION 100MHz	100
EXPANSION 133MHz	133
EXPANSION 166MHz	166
EXPANSION 200MHz	200
EXPANSION 266MHz	266
EXPANSION 333MHz	333
EXPANSION 400MHz	400
EXPANSION 500MHz	500
EXPANSION 600MHz	600
EXPANSION 800MHz	800
EXPANSION 1000MHz	1000

AST Rampage Plus/2MB \$169

AST Rampage Plus/2MB	169
AST Rampage Plus/4MB	199
AST Rampage Plus/8MB	249
AST Rampage Plus/16MB	299
AST Rampage Plus/32MB	349
AST Rampage Plus/64MB	399
AST Rampage Plus/128MB	449
AST Rampage Plus/256MB	499
AST Rampage Plus/512MB	549
AST Rampage Plus/1024MB	599
AST Rampage Plus/2048MB	649

DYNAMIC RAMS

1MB X 1-100NS	3.95
1MB X 1-100NS	4.20
1MB X 1-100NS	4.45
1MB X 1-100NS	4.70
1MB X 1-100NS	4.95
1MB X 1-100NS	5.20
1MB X 1-100NS	5.45
1MB X 1-100NS	5.70
1MB X 1-100NS	5.95
1MB X 1-100NS	6.20
1MB X 1-100NS	6.45

CACHE

1MB X 1-100NS	1.75
1MB X 1-100NS	2.10
1MB X 1-100NS	2.25
1MB X 1-100NS	1.80
1MB X 1-100NS	1.95
1MB X 1-100NS	2.00
1MB X 1-100NS	2.05
1MB X 1-100NS	2.10
1MB X 1-100NS	2.15
1MB X 1-100NS	2.20
1MB X 1-100NS	2.25

LOCAL BUS MOTHER BOARDS

386/486	299
386/486	299
386/486	299
386/486	299
386/486	299
386/486	299
386/486	299
386/486	299
386/486	299
386/486	299
386/486	299

ONE BOARD SOLUTION

386/486-64K Cache no CPU \$299	299
386/486-256K Cache no CPU \$250	250
386/486-64K Cache no CPU \$299	299
386/486-256K Cache no CPU \$250	250
386/486-64K Cache no CPU \$299	299
386/486-256K Cache no CPU \$250	250
386/486-64K Cache no CPU \$299	299
386/486-256K Cache no CPU \$250	250
386/486-64K Cache no CPU \$299	299
386/486-256K Cache no CPU \$250	250
386/486-64K Cache no CPU \$299	299

NOTEBOOK COMPUTERS

AST PowerExec 386EL25 60MB	1379
AST PowerExec 486SL25 80MB	2329
AST PowerExec 486SL25 80MB Color	2998
Compaq Contura 3/25 84MB Windows+	1479
Compaq Contura 3/25 84MB Color	1999
Compaq Contura 4/25 CX 209MB W+	3599
Compaq LITE 25E 84MB W+	2899
Compaq LITE 4.25 Color 120MB W+	CALL
Texas Instr 486/25WinSLC 60 80MB	CALL
Texas Instr 486/25WinSX 120MB	1959
Texas Instr 486/25WinDX 120MB	2489
Texas Instr 486WinDX2 50 200MB	3099
Toshiba T1800 386SX-20 80MB	1199
Toshiba T1850 386SX-25 80MB	1421

COMPUTERS

AST Premium SE 486DX33 8MB no-HD	2729
AST Bravo 486DX/33 120mb w/monitor	1899
Compaq Prolinea 386/25ZS mdl 40	749
Compaq Prolinea 486/33 mdl 120W	1429
Compaq Deskpro 486/33 mdl 120W	1849
Compaq SystemPro ALL MODELS	CALL
DTK 286/386 486 custom quotes	CALL
DTK 486DX2 66 ISA 8mb 212mb-HD	1799
Wyse Temnas 30+/50/60/32ES	279/369/289/539

DISK DRIVES

Conner CP30204 212MB 12ms IDE	319
Conner CP30544 540MB 12ms IDE	869
Imag PC Powered 90 w/adaptor	519
Maxtor 7213A 213MB 15ms IDE	289
Maxtor LXT340A 340MB 15ms IDE	587
Microplus ALL MODELS	CALL
Pacific Rim External floppy drives	CALL
Quantum drives ALL MODELS	CALL
Plus Hardcard EZ 127MB	318
Plus Hardcard EZ 240MB	519
Seagate ST3144A 130mb 16ms IDE	204
Teac FD505 dual floppy drive	129
Teac 3.5" and 5.25" disk drives	59
Toshiba 3.5" 1.44 disk drives	59

MATH CO-PROCESSORS

Cyrix 80387SX-16/20/25	85
Cyrix 80387DX-16/20/25/33	84
IIT 80387SX-16/20	59
IIT 80387DX-16/20/25/33	75
Intel 80387SL	79
Intel 80387SX-16/20/25	75
Intel 80387DX-20/25/33	88
Wetek ALL MODELS	CALL

MEMORY PRODUCTS

AST Premium Exec 4MB	179
Okidata Laser 400 2MB	129
Panasonic KXP-4410-4430 1MB	119
Texas Instr MicroLaser 1MB	79
256x4 80ns D-RAM	4 40
256x9 80ns SIMM Module	CALL
1MBx9 80ns SIMM Module	CALL
4MBx9 70ns SIMM Module	CALL

MICE

Logitech Dextra 3-button serial PS/2	39
Logitech Dextra w/Windows 3.1	89
Logitech Kidz mouse w/software	49
Logitech Mouseman	79
Logitech Trackman Portable	95
Microsoft bus or serial 400 dpi	89
Microsoft Ballpoint mouse	118

NO SURCHARGE
ON CREDIT CARDS!



**MIDWEST
COMPUTER
WORKS**

QUALITY SERVICE & GUARANTEED LOWEST PRICING!

NO SURCHARGE
ON CREDIT CARDS!

PRINTERS

PANASONIC

KXP2180	169
KXP2023 / 2123	199/239
KXP1124	269
KXP2124	299
KXP1624	339
KXP1654	539
KXP2624	359
KXP4410 Laser	619
KXP4430 Laser	859
KXP4450 Laser	1098
KXP4451 Laser	1379
KXP4455 Laser	1679

OKIDATA

184 Turbo	215
320 321	299 419
520 521	485/515
590+ / 591+	419/569
Laser 400	549
Laser 810	909
Laser 830+	850 999/1249

HEWLETT PACKARD

HP Portable	395
Deskjet 500 500C	389/509
Deskjet 550C	699
Laserjet III P	888
Laserjet 4L 4P NEW	NEW
Laserjet 4	1398
Laserjet 4M	1949
Laserjet IID	2327
Laserjet 4Si	3228
Paintjet	708
Paintjet XL 300	2258
Scanjet 2P / 2C	849/1319
Plotters	ALL MODELS

PLOTTERS & DIGITIZERS

Calcomp 12x12 / 12x18 all w/16 bit	279/558
Hewlett Packard Plotters	ALL MODELS
Kurta 12x12 XLP / 12x18 XLP	239/479
Pacific Data ProTracer	1099
Summasketch 12x12 / 12x18	299/529

BATTERY BACKUPS

American Power BK400 desktop	158
American Power AP400/AP600	299/389
American Power AP900 smartups	549
Tripp Lite BC400 400VA 4-outlets	154
Tripp Lite BC500LAN 500VA LAN port	189
Tripp Lite BC600LAN 600VA LAN port	255
Tripp Lite BC750LAN 750VA LAN port	299
Tripp Lite ISOBAR 4/ISOBAR 6	44/53

MODEMS

Boca Modem 14.4 v 42bis w Fax int	219
Cardinal 2400 baud int w Fax & Software	89
Hayes Optima 14.4 + Fax 14.4 EZ ext	399
Intel Satisfaction 100/400	98/283
Megahertz modems for all laptops	CALL
Practical Penph 14.4 send/rec fax int	295
US Robotics Sportster 14.4 fax/mdm int	179
US Robotics Courier HST 16.8 V 42bis ext	549
US Robotics pocket modems	CALL
Zoom FC9624 send/rec Fax int w soft	69
Zoom VXY32BIS 14.4 v32/32bis/42bis ext	229

IBM

IBM Execjet	659
Jetprinter PS 4079 color	2579
Laser 6 6P	1189/1389
Laser 10 / 10P	1279/1769

CANON

BJ-10EX Bubblejet	248
BJ-20 w/feeder	389
BJ-200	329
BJ-300 330	329/509
BJC-800 color	1549

STAR

NX1020R Color	159
NX2430R Color	239
Starjet 48+	285

CITIZEN

GSX 230 145	259/369
PN48 / PN48Pro	289/329

COMPAQ

Pagemarq 15	2599
Pagemarq 20	4479

QMS

410 Postscript	1219
420 Postscript	NEW
815 815MR	2869/3569
825 825MR	3359/4625
860 Hammerhead	3989
Colorsript 210	4519
Colorsript 230	7495
PS1700 PS1725	6269/5369

TEXAS INSTRUMENTS

MicroWriter Basic	NEW
MicroWriter PS17	NEW
MicroWriter PS35	NEW
MicroWriter Basic	859
MicroWriter Basic XL	1729
MicroWriter PS17+	1069
MicroWriter PS35+	1199
MicroWriter XL PS17	1999
MicroWriter XL PS35	2269

SEIKO

Smart Label Printer+	129
Smart Label Printer Pro	228
CH-4104 Color pscrip	2449

MONITORS

Goldstar 1460+ 14" 1024x768 28mm	279
Idek MF5117 17" 1024x768	919
Idek MF5217 17" 1024x768 26mm	1049
MAG MX15F 15" 1280x1024 28mm	599
MAG MX17F 17" 1280x1024 26mm	1049
Mitsubishi DiamondPro 17" 1280x1024	1069
Mitsubishi DiamondScan 20" 1280x1024	1839
Nanao F340i 15" 1024x768 28mm	729
Nanao F550i 17" 1280x1024 28mm	1138
Nanao T560i 17" 1280x1024 26mm	1799
NEC 3FGX 15" 1024x768 28mm	608
NEC 4FG 15" 1024x768 28mm	739
NEC 5FG 17" 1280x1024 28mm	1129
NEC 6FG 21" 1280x1024 28mm	2299
Panasonic C-1381 14" 1024x768	319
Panasonic C-1395 14" 1024x768	428
Samsung SyncScan 14" 1024x768 28mm	349
Samsung SyncScan 17" 1280x1024 flat	899
Seiko 1440-1450-14" VGA 25mm	359/419
Seiko 1760 17" 1280x1024 25mm	1019
Seiko 2050 20" 1024x768 31mm	1279
Sony CPD1430 14" 1024x768 25mm	598
Sony CPD1604S 17" 1024x768 25mm	1008
Sony GDM-2036S 20" 1280x1024 30mm	2019

VIDEO BOARDS

ATI VGA Integra 1024x768 512k	79
ATI VGA XL24 24-bit 1MB	142
ATI Graphics Ultra + 1MB w/mouse	287
ATI Graphics Ultra Pro 1MB w/mouse	425
ATI Graphics Ultra Pro EISA 2MB	579
Boca Basic VGA 640x480	55
Boca SVGA 1024x768 512k 1MB	69/99
Diamond Speedstar 24X 1MB 24-bit	157
Diamond Stealth Pro 1MB 2MB	249/339
Hercules Graphics	CALL
Number Nine GXE Level 10	399
Number Nine GXI TC Level 29	1489

NETWORKING

3COM 3C563 Etherlink II	184
3COM 3C509 Etherlink II	129
Digiboard ALL MODELS	CALL
Intel Ether Express 16-bit coax	118
Lantronic Ethernet AE-2 Starter Kit	448
Lantronic Windows AE-2 starter Kit	448
Netware 2.2 5-user 10-user	469/929
Netware 3.11 5-user	549
Netware 3.11 10-user	1249
Netware 3.11 20-user	1749
Netware 3.11 50-user	2499
Netware 3.11 100-user	3499
Netware 3.11 250-user	6299
Netware SFT III	NEW
Netware 4.0 CD-ROM or 3.5"	NEW
Netware Upgrades Available	CALL
Netware Lite software	69
NE1000/NE2000 Boards	99/135
SMC Arcnet PC130/270E	69/108
SMC Arcnet PC600WS/PC600FS	119/198
SMC Ethercard+ Elite/Elite16	105/129
Tara 0196 arcnet 0120 ethernet	115/99
Thomas Conrad 6245 Arcnet 16-bit	176
Xircom pocket lan adapters	CALL

FAX MACHINES

Hewlett Packard FAX series	CALL
Canon ALL MODELS	CALL

WHY MIDWEST COMPUTER "WORKS" FOR YOU

WIDE SELECTION
Huge inventory. Thousands of items in stock and ready for immediate shipment!

ON-TIME
In-stock orders are shipped the same day. We are fast & efficient.

RELIABILITY
We earn your business! Over 70% of our orders are repeat customers.

KNOWLEDGEABLE
All of our salespeople are technically trained to provide you with the right solution!

SERVICE
If you don't find it..ask, our friendly staff will special order products for you!

NEW! AST POWEREXEC EL 25MHz
•Intel 386SL 25MHz 2mb-RAM
•Expandable to 20mb RAM
•1 44mb built in floppy
•60MB hard drive
•VGA while 9.5" LCD display
•1 ser. 1-par. VGA, mouse or keyboard ports
•5.9 lb. 8.5"D x 11"W x 1.8"H
•3 to 4 hour battery life
CALL

TEXAS INSTRUMENTS TM4000 WinSLC/25
•486SLC 25MHz 2mb-RAM
•Expandable to 8mb RAM
•60mb hard drive 80MB optical
•10" VGA Display
•1 ser. 1-par. VGA, mouse or keyboard ports
•Windows 3.1 w/mouse
•5.6 lb. 1.8" thick
•3 to 5 hour battery life
\$1689

TEXAS INSTRUMENTS TM4000 WinSX/25
•Intel 486SX 25MHz 4mb-RAM
•Expandable to 20mb RAM
•120mb hard drive 3.5" floppy
•10" VGA Display 1MB RAM
•1 ser. 1-par. VGA, mouse or keyboard ports
•Windows 3.1 w/mouse
•5.6 lb. 1.8" thick
•3 to 5 hour battery life
\$1959

NEW! TEXAS INSTRUMENTS TM4000 WinDX/25
•Intel 486DX2 50MHz
•8mb RAM Expandable to 20mb
•200mb HDD 3.5" floppy
•10" VGA Display 1MB RAM
•1 ser. 1-par. VGA, mouse keyboard ports
•Windows 3.1 w/mouse
•5.6 lb. 1.8" thick
•3 to 5 hour battery life
\$3099

COMPAQ Contura
•Intel 386SL & 486SL 25MHz
•4mb RAM, maximum 20
•1 44mb built in floppy
•84 120 or 209mb HDD
•VGA mono or color display
•1 ser. 1-par. VGA, keyboard and keyboard ports
•6.2 lb. 1.9" thick
CALL FOR PRICES

MICROTEK ScanMaker II XE
This incredible high speed scanner can transform your originals into stunning 24-bit color, 8-bit grayscale or 1-bit B&W images at resolutions up to 1200 dpi! Included with the ScanMaker II XE is **ALDUS PHOTOSTYLER** editing software a \$795.00 retail value!

OUR #1 SELLING COLOR FLATBED SCANNER
ScanMaker II w/ImageStar II **\$879**
ScanMaker II XE w/Photostyler **\$1149**
Available options: 50-page Automatic document feeder, Transparency scanning adapter

SONY Desktop Library
System includes: Internal tray loading CD-ROM player that is MPC & Multi-session Photo CD compliant, Pro Audio Spectrum 16 sound board and stereo amplified speakers with batteries.
Software included: New Groliers Encyclopedia, Great Wonders of the World, Time Magazine Compact Almanac, Where in the World is Carmen Sandiego, The Presidents: It all Started with George, Tempra Access and GeoWorks CD-ROM Manager!
All for only **\$619.00**
*External version CDU-7305 also available \$769.00

SONY SONY CD DESKTOP LIBRARY
System includes: Internal tray loading CD-ROM player that is MPC & Multi-session Photo CD compliant, Pro Audio Spectrum 16 sound board and stereo amplified speakers with batteries.
Software included: New Groliers Encyclopedia, Great Wonders of the World, Time Magazine Compact Almanac, Where in the World is Carmen Sandiego, The Presidents: It all Started with George, Tempra Access and GeoWorks CD-ROM Manager!
All for only **\$619.00**
*External version CDU-7305 also available \$769.00

MIDWEST COMPUTER WORKS
180 Lexington Drive, Buffalo Grove, IL 60089

800-85-WORKS (800-859-6757)
TECH SUPPORT & CUSTOMER SERVICE 708-459-6883 • FAX 708-459-6933
WE GUARANTEE THE LOWEST PRICES AND THE BEST SERVICE!

TECHNICAL
•C.O.D. orders accepted
•Your credit card is not charged until the product is shipped
•Personal and company checks will delay order 2 weeks
•Call us for quantity discounts
•Prices subject to change
•We check for stolen credit cards
•No extra charge for credit cards
•Foreign orders are welcome

CIRCLE 010 ON READER SERVICE CARD

PACIFIC WAVE

TECHNOLOGY

SPECIALIZING IN INTERNATIONAL ORDERS

COMPUTERS

IBM PS/2	
PS/2 Mod 30 EOI 286	250
PS/2 Mod 65 120 Mb 386	650
PS/2 Mod 70 A21	1300
PS/2 Mod 90/95-486	Call
Think Pad 700/700 C	2699/3895

IBM PS VALUE (w/Mouse & Dos)	
386 SLC 25 0/80/170 Mb	835/979/1160
486 SX 25 0/80/170 Mb	1018/1240/1440
486 DX 33 0/120/210 Mb	1385/1598/1789

COMPAQ	
DPro 486 DX2 66 212 Mb w/windows	2895
Contura 3/25 60/120	1390/1500
Prolinea 120/240/W/50 Mhz	Call
LTE SL/25 60/80/120	2460/2640/2995
LTE Color 80 120 Mb 486	Call/3795
DPro 486/50 M	Call
DPro 486/66 M/1	Call
DPro 486/33 M (All Models)	Call

TEXAS INSTRUMENTS	
Travelmate TM 4000 SX/25 120 Mb	2395
Travelmate TM 4000 DX/25 120/200 Mb	2795/3049
Travelmate TM 4000 DX/50 200 Mb	3314
Travelmate TM 4000 DX2/40 Color 200	3790

AST	
Bravo 486 DX/33 MDL 3V	1350
Bravo 486 DX 2/66	1979
Power Premium 486 DX 33 MDL 3V	1977
Power Premium 486-50 D MDL 3V	2130
Power Exec 386/25 SL 60/120	2150/2499
Power Exec 386/25 SL Color	Call
Power Exec 4/25 SI	Call

TOSHIBA	
T1850 80 Mb LCD/Bundle	1429/1698
T1850 120 Mb LCD	1665
T1850 C 80/120	2099/2550
T3300 SC 120/LCD	Call
T4400 SX 120/LCD	2350
T4400 C 120/200	3425/3999
T4500 80/120/200 C	2325/2525/3750
T6400 MM 200 Mb Color	7995

MONITORS & TERMINALS

MONO/COLOR	
IBM 8504	250
Samsung 14" VGA Mono	129

VGA/SVGA MONITORS	
IBM 8515/8518/8513	560/499/250
IBM 6312/6314/6319	415/510/630
IBM 9515/17/18	620/1209/512
MAG 15" 17/F	595/1079
Samsung Syncmaster 4 17"	775
NEC 3FGX/4FG	559/899
NEC 5FG/6FG	1259/2349
Packard Bell VGA 8539/29/28	230/270/359
Panasonic 1381/95 1991	339/479/1599
Sony CPD 1304/1604S	599/1019
Zenith 1495	595

VIDEO BOARDS

ATI Ultra Plus 1 Mb/2 Mb	295/339
ATI Ultra Pro 1 Mb/2 Mb	426/499
ATI Ultra Pro 2 Mb ISA/MCA	599
ATI Wonder XL 24 512/1 Mb	132/149
Diamond Stealth VRam	255
Diamond Speedstar 24/24k	149/159
Mono/w Parallel Card	45

PRINTERS

CANON	
BJ 10 EX/BJ20	249/399
BJ 20	Call
BJ 200/300/330	345/339/599
BJ 300	1899

CITIZEN	
GSX 230/240+145	259/339/399
PN 48 Professional	339

EPSON - 220V Available	
Action Laser 1000/1500	649/795
Action Printer 2250/3250	135/195
FX 870	288
FX 1050	359
FX 1170	383
LQ 570	254
LQ 870	454

HEWLETT-PACKARD - 220V Available

LaserJet 4/4M	1394/1925
LaserJet 3D/4D	2349/Call
LaserJet 4SI	3300
LaserJet 2P+/3P	799/899

Toner & Cable included with all lasers	
DeskJet 500/550C	360/699
DeskJet Portable	399
ScanJet II P	840
ScanJet IIC Color Scanner	1415
PaintJet XL 300	2279
HP Options	Call

FONTS & MEMORY	
Pacific Data 25-1 III/DeskJet	259/109
Pacific Data 1/2/4 Mb	89/120/175
Pacific Page PE/XL	289/671
Pacific Data Plotter in a Cig	239
Compaq 1/4 Mb Modules	118/275
IBM T, Toshiba AST	Call
CPI Superset 425+	219
CPI DeskRam 256k DJ500	89
CPI 66 Font DJ500	109

IBM (IBM & MAC)	
Exec Jet	625
Laser Printer 10/10L	1299/1599
Laser Printer Options	Call
IBM 2390/2391.4226	346/460/400
IBM Portable	375
IBM ColorJet	2600

NEC	
Silent Writer 990	2499
Silent Writer 2 Mod 95	1399
Silent Writer 2 Mod 97	Call

OKIDATA (IBM & MAC) 220V Available	
ML 184	215
ML 320/321	324/435
ML 590/591	439/585
ML 393+/393+color	919/999
Okilaser 400/810	590/1075
Okilaser 820 830/840	1276/1325/1549

PANASONIC	
1123/1180 L	214/160
1124/1624	291/349
1654/1695/2624	528/364/379
2123/2124	244/329
2180	181
4410/4430/4450/4455 Laser	649/899/1099/1750

TERMINALS

Wyse 50/60	375/300
Wyse 30/85	310/339
Wyse 150/185	289/379

SOFTWARE

All Mac Titles Available	Call
Aldus Pagemaker 4.0	495
Ashton Tate dBase III+/IV	419/479
Borland Quattro Pro 4.0	299
Carbon Copy 6.0	133
Compaq/IBM DOS 5.0	89/125
Harvard Graphics 3.0/Wind	370/325
Laplink Pro	103
Lotus 1-2-3 2 4/3 1	329/399
Lotus Windows 1.1	299
Microsoft All Titles-Lowest Price	53
Microsoft DOS Upgrade	53
Microsoft Excel 4.0	295
Microsoft Office-Windows	455
Microsoft Windows 3.1	89
Microsoft Word-Windows	289
Microsoft Works-Windows 2.0	114
Norton Util 6.1	114
Procomm Plus V2	63
Quattro Pro	304
Quicken 6.0	38
Stacker 3.0	88
Ventura Publisher V 3.0	479
WordPerfect 5.2/Windows	260
1200 Additional Titles In Stock	

PLOTTERS & DIGITIZERS

HEWLETT-PACKARD	
7475A/7550B	1349/2699
7570A/7575A	2999/3350
7576 EXL	4150
SUMMAGRAPHICS	
Summasketch 2+ 12X12/12X18	289/515
CALCOMP	
Pacesetter 2024/2036	2899/3700

Digitizer 12X12/12X18	298/597
-----------------------	---------

MULTIFUNCTION BOARDS CARDS & CHIPS

IBM 5250 Emulation	533
IBM 3278, 3279 Emulation	Call
Token Ring 16/4	625
AST 5251 Emulation	499
AST 6-Pack w/384 k	145
Intel AboveBoard Plus w/512 k	289
Intel 80387-SX	77
Intel 80387-DX	85
Cyrix Fasmath	Call

MODEMS & COMMUNICATIONS

ATI 9600 ETC	Call
Boca 14.4 Fax/Modem Int/Ext	219/275
CPI 2400 Internal	49
Everex 2400/2400 MNP	99/164
Hayes 2400/2400B	289/218
Hayes Ultra 96	569
Hayes Ultra 144	760
Practical Pocket Modem	99
Practical 14.4 Int/Ext	350/380
Intel 14.4 Ext	444
MegaHertz Laptop Modems	Call
Supra 14.4 w/Fax Int/Ext	219/299
US Robotics Courier HST	485/515
US Robotics Data Std	760/779

FAX MACHINES

Hewlett Packard Plain Paper 200/310	999/1299
Hewlett Packard Laser Fax	920
Intel Satisfaction 100/200	115/293
Intel Satisfaction 400/400E	389/437
US Robotics World Port 2496	259
MegaHertz Pocket 2400 S/R Fax	249
MegaHertz Pocket 96/96 SR	479

MICE

Logitech Mouseman	72
Logitech Scanman 32/256	139/260
Microsoft Mouse+Windows 3.1	92/144
Microsoft Ballpoint/Windows 3.1	115/144

DRIVES & TAPES

Colorado DJ10/20	169/240
Colorado Tracker Parallel 120/250	345/414
Conner 40/80	185/215
Conner 120/210/360/540	228/399/819/909
Creative Labs Multimedia Upg Kit Int/Ext	548/606
Plus II XL50/105	228/375
Inwin All Models	Call
Mountain All Models	Call
NEC CDR 74/84 MPC	609/542
Panasonic LF 7010 1 Gb	2740
Erasable Optical Drive	175
Parallel Port Ext Floppy	175
Procom PS2 Hard Drive 120/200 Mb	Call
Sysgen Mobile Disk 40/80/124 Mb	319/419/527
Sysgen 21 Mb Floptical Drive Kit	335

NETWORK

ARTISOFT	
Lanlastic 2 Mb Starter Kit	138
Lanlastic 2 Mb Adapter	139
Lanlastic 10 Mb Starter Kit	469
Lanlastic AE3 Starter Kit	539
Lanlastic 10 Mb Adapter	199
NETWARE	
Netware 2.2 5-User	Call
Netware 2.2 10-User	1162
Netware 3.11 5-User	629
Netware 3.11 10/20-User	1350/1795
Netware 3.11 100/250-User	3699/6795
NE 1000/NE 2000	149/162
NE/2 /NE 3200 (EISA)	249/687
SMC	
Arcnet PC 130 8 Bit	99
Arcnet PC 600 15 16 Bit	220
Arcnet PC 600 ws 16 Bit	139
Ethercard Plus Elite 16	155

MISC. & ACCESSORIES

Keytronic KB101+	90
Kensington Masterpiece/Plus	85/95
AB Switch Box	27
Tripp Lite - All Models	Call
American Power Conversion - All Models	Call

Call for
our
12,000
item
Electronic
Price
Catalogue

1 (800) 348-4727



1 (800) 348-4727



0031-11-1865



通訳サービス

0014-800-126-943



0130-816218



Dolmetscher

0800-89-4935



For all other
countries, dial
80 887 51 100



In Hawaii (808) 875-1100
Shipping & Technical Assistance
1 (808) 875-1100
FAX (808) 875-0061

HOURS: 9:30 am - 6:00 pm CST
MON - FRI: 10 am - 4 pm CST
PACIFIC WAVE TECHNOLOGY
P.O. BOX 840312
DALLAS, TX 75284-0312

Most orders shipped within 48 hours / 24-hour worldwide order tracking / Printer orders received by 9 PM CST can be shipped same day All credit card and COD orders checked electronically / We accept Amex, Visa, MC, JCB, Discover, Diners Club, Carte Blanche, COD's, Wire Transfer. **TERMS & LEASE AVAILABLE** (one day approval) Credit cards not charged until product shipped. **GOVERNMENT AND EDUCATIONAL P.O.'S ARE WELCOME** Allow 10 days for persona checks to clear. Prices reflect a 3 percent cash discount. Non-defective returns subject to a restocking charge. All warranties good through Pacific Wave Technology. Prices subject to change without notice. All freight charges to be incurred by purchaser for refused COD shipments / Please allow 24 hours on large credit card orders.

CIRCLE 145 ON READER SERVICE CARD



FIRST SOURCE INTERNATIONAL PRESENTS MEMORY AND MUCH MORE...

7 more great reasons to purchase from First Source . .

It seems that everytime I deal with a service organization these days, something gets screwed up. I thought I'd let you know that you are an exception. Thank you for your help and keep up the good service. *D. Frankel, Minnesota*

It is a pleasure to know that there is someone in the computer merchandising and service area that is genuinely concerned with customer satisfaction. Because of the professional and dedicated manner in which you handled my computer needs, First Source will be my initial contact for any future computer memory requirements. *C.D. Smith, California*

I want to congratulate you for the best mail-order delivery I ever had. I'm completely satisfied. *M.A. Branschiwicz, Switzerland*

I am writing to commend you on the excellent service I received in connection with my order. The person that took the telephone order was very knowledgeable about the product and I received the order within a few days - ever sooner than I expected. *J.E. McFarlane, Alaska*

As someone who is highly dependent upon computers for daily work and research, I would like you to know exactly what a pleasure it is to deal with First Source. When it comes to mail order memory, your company is simply the best. I think that First Source really exceeds all others. What I particularly like about it, is its high level of customer service. In an era when it is often difficult to acquire quality products and service from mail order firms, it is good to know that a company like yours exists. *D.N. Glambert, New York*

Please pass my compliments to your customer service staff. The representatives were knowledgeable, helpful, and courteous. Their friendly yet thorough conversation and sales/service efficiency project a very positive company image. *A.D. Routh, APO AE*

Please let me mention that the service you provided in this case was absolutely excellent and I made a lot of positive promotion for your company and the good service. *J. Jack, Germany*



If you are unsure of the proper upgrade path for your computer system or laser printer and would like a straight answer, take a moment to call First Source. Call toll free from anywhere in the U.S.A. or Canada, send a letter, or a fax. We are happy to respond immediately to all your questions.

Toll Free from the US or Canada
800/824-9866
International
714/588-9866
Fax/Telex
714/588-9872

Personal Computer Memory

IBM		
PS/1 286, 5MBX		
286 929935	\$89	486 929904 \$149
PS/1 Constant, Essential & Expert models 485, 544 & Valueport all models except Cx series		
486 909290	\$159	586 909291 \$179
PS/1 Constant, Essential & Expert models Cx series		
1080 921		909291 \$179
PS/2 25/286, 34/286, & memory adapter 163723		
286 921		909290 \$179
PS/2 555E, 15, 4MB, 555E, 15, 655E, 15, 70, & 85MB		
985	\$450005	\$49
286	\$450004	\$79
PS/2 70-82E, 80E, 92E, 94E, PS/1 Constant, Essential & Expert models 471, 473 & 474, Valueport Cx series		
286	\$450000	\$79
PS/2 555E, 15, 4MB, 555E, 15, 655E, 15, 70, & 85MB, Valueport Cx series & adapter board 34F014 or 34F077		
486	\$450003 or \$79077	\$149
PS/2 555E, 15, 4MB, Valueport Cx series		
486	\$450002	\$209
PS/2 90 90, 95 95, 95 95 (9095), 50, 57 (all), PS/1 Pro 92C23		
286	\$450002	\$89
PS/2 90 90, 95 95, 95 95 (9095), 50, 57 (all), PS/1 Constant, Essential & Expert models 471, 473 & 474, PS/1 Pro 92C23		
486 6450120	\$149	486 6450150 \$239
PS/2 90-99E, 37E, 52E, 52E, 90E, 101		
286	\$450073	\$89
PS/2 90-82E, 83E, 84E		
486	\$451040	\$179
Expansion boards for 50, 50E, 555E, 60, 655E		
2-8MB W/286	\$487239	\$269
2-16MB W/286	\$450009	\$309
Expansion boards for all models 70 & 80		
2-16MB W/286	\$451077	\$329
4-16MB W/800	\$451091	\$409
Expansion boards for all models 70, 80, 90, & 95		
4-64MB W/800	N/A	\$629

Compaq

Proline 5/25c, 5/25c		
286 101730-001	\$89	486 101731-001 \$289
Proline 4/25c, 4/30, 4/30		
510 101082-001	\$55	286 101083-001 \$89
486 101084-001	\$159	486 101085-001 \$209
DeskPro 386-20, 20c & 25		
486 Module	101532-001	\$179
486 Board	101543-001	\$219
DeskPro 386/16		
486 Module	101534-001	\$179
486 Board	101535-001	\$219
DeskPro 3/25c, 3/30, 4/25c, 5/30, 640, 204K, 304K, 512/20, 20K		
SystemPro LT Series, Proline PC Server 486/30, 512/30		
PortAble 486 & 5 Series (expandable)		
985 100000-001	\$49	286 100000-001 \$85
486 100000-001	\$159	486 100000-001 \$179
ProSignia PC Server 486/33, 602/36		
16MB 100320-001	\$199	32MB 100347-001 \$209
SystemPro XL (486-50)		
16MB 100310-001	\$799	32MB 100317-001 \$1099
48MB N/A	\$4099	128MB 100318-001 \$1899
DeskPro 386-33, 480-33, & SystemPro		
286 101144-001	\$99	486 101145-001 \$289
32MB	101058-001	\$1299
DeskPro 386M, 486M, SystemPro LT (32-80 Exp. board)		
2-64MB W/286	\$29900	\$339
DeskPro 386/33, 486/33, SystemPro		
6 Socket 3rd W/286	101000	101144-001 \$319

DELL

Power Desktop 3250, 325P, 3350, 335P, 435P, 480P & 480		
160 510-2505	\$59	480 510-2507 \$149
Power Desktop 480P & 480		
160MB module	510-2625	\$399
PowerLine Workstation 420, 425, 435, 450, 4500E/2 & 4600		
286 510-2404	\$59	480 510-2407 \$179
486 510-2408	\$199	160MB 510-2409 \$429
PowerLine Workstation 420, 425, 435, 450, 4500E/1 & 4600		
32MB 510	510-2630	\$1799

NEC

PowerLite 286/32, 51/30 & 51/20		
286 610	09-410-8105	\$89
PowerLite 580SL/20c, 20c, 10c, 25c, 40c/50c, 48c/58c		
610 610	09-410-2101	\$179
PowerLite SX Plus		
286 Board	N/A	\$279
486 Board	N/A	\$359
PowerLite SL/20		
286 CPU Upgrade	09-410-8101	\$189
286 Exp. Board	09-410-8102+8105	\$289
PowerLite 580/20c, 25		
286 APC-9055	\$329	486 APC-9056 \$469
PowerLite 586/33E & 606/25E		
286	09-410-5101	\$189
PowerLite 586/33E, Express V & a series		
486	09-410-6205	\$179
1080	09-410-6206	\$449

Apple

Macintosh SE/30, II, Ix, Ix, Ix, Ix, Ix		
486 610	909231-1	\$129
Macintosh IIx, Ix, Ix		
160MB 610	N/A	\$449
Macintosh II, Ix, Ix, Classic II, Performa 200, 400 & 600		
486 N/A	\$129	600 N/A \$239
Macintosh Quadra 700, 900 & 950		
160MB N/A	\$449	32MB N/A \$189
Macintosh Ix		
160MB N/A	\$472	64MB N/A \$1054
Macintosh Quadra 900, Centris 610, 650 & LC II		
486 9150771/A	\$129	600 N/A \$449
1000 9150771/A	\$199	32MB N/A \$189

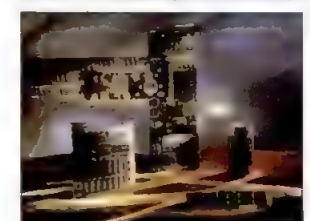
DEC

DECtronic 5 series SE, C, Plus, & 425C		
286 910	PC308-CE	\$89
DEC 4005T Series		
486 PC308-CE	\$299	160MB PC308-CE \$649
DEC 4205C, 433 & 433T		
286 PC308-CE	\$199	600 PC308-CE \$289
DEC 3000 LP, 4205 LP, 4334 LP, 4504 LP, 4604 LP		
486 PC308-CE	\$279	160MB PC308-CE \$649

Zenith

Z-500/400 Series Z-425/3X, Z-425/3X, Z-433/3X, Z-433/3X		
486 910	\$159	160MB 910 \$399
Z-Serve 425E, 435E, 450E		
486 910	\$159	160MB 910 \$399
Z-3200A, 3250A, 3250A, 3250A, 3250A, 3250A, 3250A		
486 910	\$159	160MB 910 \$399
Z-3200A, 3250A, 3250A, 3250A, 3250A, 3250A, 3250A		
486 910	\$159	160MB 910 \$399
Z-3200A, 3250A, 3250A, 3250A, 3250A, 3250A, 3250A		
486 910	\$159	160MB 910 \$399
Z-3200A, 3250A, 3250A, 3250A, 3250A, 3250A, 3250A		
486 910	\$159	160MB 910 \$399
Z-3200A, 3250A, 3250A, 3250A, 3250A, 3250A, 3250A		
486 910	\$159	160MB 910 \$399

Kingston TECHNOLOGY CORPORATION



AST

Bravo 386-33, 51/20, 51/20		
286 500510-002	\$89	486 500510-000 \$179
Bravo 3/25c		
286 500710-004	\$99	486 500710-002 \$199
Advantage Plus 486/33, 602-50, 612-50		
486 500510-000	\$179	486 500710-001 \$199
Advantage 386/25, 25, Advantage Pro SL/25, Bravo 3/30		
286 500602-001	\$75	486 500602-002 \$339
Advantage Pro 486/33, 602-50, Bravo LC 4/25, 33, 50, 60		
286 500607-001	\$89	486 500607-002 \$159
500 500607-004	\$499	52MB 500607-005 \$189
Premier 386/25, 33, 33T, Premier II 386/33, 20, 25		
160MB 500607-002	\$129	\$89
Advantage 486/25, 33, 33T, Bravo 4/33, 486/25, 486/25		
Premiere 4/25, 4/33T, Server SE 4/33		
286 W/800	500714-004, 700-005	\$119
Premiere 684/33T, 586/33, 586/33, 586/33, 586/33		
486 W/800	500714-004	\$159
Advantage 484/25, 33, 33T, Power Premier 5/33, 4/33, 510, 640, Premier 386/33T, 484/25, 25E, 25T, 33, 33T, 33T, Premier II 484/25, 33, 484/33, 50/20		
Premiere Server SE 4/33		
600 W/800	500714-001	\$289

Hewlett-Packard

Vectra 65/160, 200P, 15/20c, 30c, 25, 25c		
486 610	91542 or 91543	\$189
Vectra 386/160, 386/200, 386/250 PC		
286 02400A	\$79	486 02400A \$279
Vectra 486PC, 25T, 33T, 486/25, 25c, 33c, 50c, 640		
286 02501A	\$49	486 02501A \$309
486	02501A or 02501A	\$449
Vectra 386/25, 486/250, 486/330, 486/500, 486/640		
286 02501A	\$49	486 02501A \$309
Vectra 486/250, 486/330, 486/500, 486/640		
1080	92070A	\$579

Laptop and Notebook Memory

Apple

PowerBook 100, 140, 145 & 170		
286		\$89
486		\$175
600		\$239
PowerBook 160 & 160		
486		\$189
600		\$219
PowerBook Duo 210 & 230		
486		\$189
600		\$219
PowerBook 190c		
486		\$209
600		\$239

AST

PowerLite 3/25L, 3/25L-C & L		
486		\$179
600		\$249
Premiere Elite 200, 300SL/20, 25, 25c		
486		\$129

Compaq

Contour 3/20, 3/25, 3/25c		
486		\$189
600		\$209
LITE 286		
286		\$89
486		\$189
LITE 386/20		
286		\$109
LITE Lite 20, 25, 25c, 25c		
286		\$109
486		\$139
160MB		\$129
LITE Lite 4/25c		
486		\$219
600		\$239
LITE 286		
486		\$129
LITE 586/20		
486		\$179

IBM

ThinkPad 500		
286		\$159
486		\$429
PS/2 CL575X, ThinkPad 700 & 700c		
486		\$219
600		\$309
PS/1 Notebook (486)		
286		\$159
486		\$349
L485X, 485X & PS/Note 162		
486		\$195
L485X & PS/Note 162		
486		\$285
PS/Note 165SL		
286		\$159

NEC

UltraLite & Cellular Workstation SL/20		
280		\$179
480		\$200
UltraLite III, SL/25C		
480		\$160
UltraLite SL/20, SL/20P		
280		\$160
480		\$180
ProSpeed 280, 386SX/16		
480		\$179
ProSpeed 386		
280		\$160

Laser Printer Memory

Hewlett-Packard LaserJet HP, HP, HP, HP			
2800 584750	\$80	480 584770	\$150
Hewlett-Packard LaserJet II and III			
2800 584400	\$80	480 584400	\$150
Hewlett-Packard LaserJet III, 4, 400 and XL300			
1000 C2063A	\$40	2000 C2064A	\$80
4000 C2065A	\$160	4000 C2066A	\$200
Hewlett-Packard DeskJet 500, 500C			
2500 227070			\$30
Compaq PASCAD 15 and 20			
4000 126341-001	\$325	16000 126362-001	\$440
Apple LaserWriter III and IIg			
4000 100202L-1	\$124	16000 N/A	\$430
Apple LaserWriter Pro 800 and 850			
4000 105071L/A	\$160	4000 105081L/A	\$240
Apple LaserWriter Select 100			
1000 1020776/A	\$240	4000 1020796/A	\$240
Apple LaserWriter Select 110			
1000 1020906/A	\$240	4000 1020946/A	\$240
IBM/Lanmark Laser A200 All Models			
2800 1005334	\$80	4800 1005335	\$120
IBM/Lanmark Laser 4000 and 4000C			
2800 1005337	\$110	3.5000 1005337	\$160
Canon LBP-4, LBP-4S, LBP-4S			
2800 505-2230	\$110	2800 N/A	\$160
Canon LBP-4S, 400 and 400T			
2800 505-1000	\$120	4800 N/A	\$200
Canon LBP-III and III Plus			
2800 505-2350			\$240
Brother HL-4			
2800 80-420	\$170	4800 80-400	\$210
Brother HL-101/101P			
2800 80-1020	\$165	4800 80-1040	\$205
Panasonic LaserPartner 4010 and 4020			
2800 KX-P441	\$100	4800 N/A	\$170
Panasonic LaserPartner 4020 and 4020			
2800 KX-P441	\$110	4800 N/A	\$180
Panasonic LaserPartner 4020			
2800 KX-P442			\$110
NEC Laser 2100 and 2200			
1000 LK01-0C	\$120	2800 LK01-00	\$170
Epson LK-1000A 300dpi			
2800 N/A	\$270	4800 N/A	\$400
Epson LK-1000A 300dpi All			
1000 N/A	\$70	4800 N/A	\$100
Toshiba Page Leader II			
2800 L30-800090	\$80	4800 L30-800040	\$160
OKI Laser 400			
1000 7004201	\$70	2800 7004201	\$80
OKI Laser 600 and 620			
2800 N/A	\$110	4800 N/A	\$180
OKI Laser 810			
1000 70021001	\$110	2800 70021001	\$160
OKI Laser 830 and 840			
2800 7001901			\$120
Yamat Instruments MicroLaser and XL			
1000 255759-0001			\$40
Epson EPL 8000			
2800 105401	\$80	4800 N/A	\$160
Epson AcuteLaser II, EPL 8000			
2800 N/A	\$160	4800 N/A	\$250
Epson EPL-7500			
2800 CE2201	\$100	4800 CE2201	\$200

Expansion Boards



For any 286 or 386!

Bocastar AT Plus 2-GB memory board for 80286 & 80386 IBM compatible machines running up to 33MHz. Get conventional, expanded (LIM EMS 4.0) and/or extended memory, OS/2.

With 286	\$160	With 486	\$220
With 680	\$250	With 680	\$300

Bocastar 8-Bit: Up to 2MB of expanded memory for IBM PC/XT/ATs, PS/2 Models 25, 50, 50/286 & compatibles.

With 286	\$100	With 386	\$270
----------	-------	----------	-------

Memory I/O Boards

Bocastar AT I/O Plus 2-4MB memory board, same as AT Plus with 1 serial and 1 parallel port.

With 286	\$190	With 486	\$270
----------	-------	----------	-------

CoProcessors



Chips and Technologies, Inc.

Introducing the Price Performance Leader in Math CoProcessors.

Chips and Technologies

3870000-10	\$50	3870000-20	\$70
3870000-25	\$72	3870000-35	\$75
3870000-40	\$80	3870000-50 (3D)	\$100
3870000-20 (3D)	\$71	3870000-25 (3D)	\$74
3870000-35 (3D)	\$80		

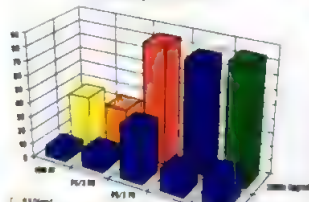
We also carry the complete line of Intel coprocessor products.

Processor Upgrades

Upgrade your system to 386 or 486 power!



Increased Performance Using Kingston Processor Upgrades! (Landmark Speed 2.0 in MS-DOS)



Kingston processor upgrades provide an easy and cost effective way to give your system the processing power it needs for today's graphical user interfaces. All Kingston upgrades are tested fully software compatible by the National Software Testing Laboratories. If you are looking for a way to improve the performance of DOS 5.0, Windows, OS/2 and other business, graphic and CAD/CAM programs without purchasing a new system, look to Kingston Technology!

Kingston Processor Upgrades are now available for:

- ✓ AGI
- ✓ AST
- ✓ Compaq
- ✓ Hewlett-Packard
- ✓ Epson
- ✓ IBM Original
- ✓ IBM PS/2
- ✓ NEC
- ✓ Zenith
- ✓ Toshiba

*Please call for specific models.

SLC/Now! Includes 1024 cache and compressor socket

386/25MHz (SLC)	\$180
386/33MHz (SLC)	\$210

SLC/Now! Includes 1024 cache and compressor socket

386/20MHz (SLC)	\$120
386/33MHz (SLC)	\$210
386/30MHz (SLC)	\$300

486/Now!

486/25MHz (SX)	\$420
486/33MHz (DX)	\$630

MicromASTER

486/25MHz (SX) with OK	\$620
486/33MHz (DX) with OK	\$1200

ATMaster

486/25MHz (SX) with OK	\$900
486/33MHz (DX) with OK	\$1430

You can also add memory to the MicromASTER or ATMaster:

With 4MB add	\$140
With 8MB add	\$280
With 16MB add	\$570

Video Cards

Diamond Computer

Switch Pro 100	\$240	Switch Pro 200	\$300
Switch 24 100	\$180	Switch 24 200	\$150
Viper VLB 100	\$210	Viper VLB 200	\$400
Switch VLB 100	\$240	Switch VLB 200	\$300

ATI Technologies

VGA Wonder II 100	\$160
Graphics Ultra 100	\$270
Graphics Ultra Plus 200	\$330
Graphics Ultra Pro 200	\$400

Kingston Technologies

Videc 16 32X, Windows Accelerator	\$110
-----------------------------------	-------

Boca Research

Support Accelerator VGA 100	\$180
Support VGA 100, 11 in Java PC Computing	\$150
Support VGA 512X, PC World best buy!	\$80

Creative Labs

Video Blaster	\$120
Video Spigot	\$400

Others:

Paradise 6014/A Plus MCA 512X	\$180
Paradise 6014/A Plus MCA 512X	\$200
Mathless Premier 620 100	\$200
Mathless Premier 620 200	\$430
Number Line PG200 Level 40	\$410
Number Line PG200 Level 11	\$570
Number Line PG200 Level 12	\$750

Motherboards

ATI-486 VESA Local BUS

The ATI-486 V/L from Advanced Technology, Inc. represents the next generation in advanced design for 486-based motherboards. Designed on to a Baby-AT platform, the ATI-486 V/L lets you get full 32-bit operation of VGA Windows applications and full 32-bit (16/32) disk cache elements.

- On-board memory expandable to 32MB of 32-bit memory.
- 8.5" x 10.5" Baby-AT board size.
- Includes 256KB of on-board cache.
- 2 VESA Local Bus Slots: two 32-bit.
- 6 ISA expansion slots: two 16-bit, two 8-bit.

00486012-66MHz VLB	\$990
00486012-50MHz VLB	\$850
00486012-33MHz VLB	\$670

586DX Cache Motherboards

- Baby AT Form Factor (8.5" x 10.5")
 - Intel or AMD 0586 CPU with AMI BIOS
 - Includes on-board cache
 - Up to 32MB on-board with 4MB or 8MB SDRAM (Price 80)
- | | |
|-----------------------------|-------|
| 00386DX-33MHz w/16KB cache | \$230 |
| 00386DX-40MHz w/128KB cache | \$249 |

Fax Modems



For AST, Compaq, IBM, Sharp, TI, Toshiba, Zenith and many other Laptop and Notebook Systems.

PCMCIA 2.0 FAX/Modems with XMODEM

14,400bps FAX/Modem, Cellular, Antennae	\$485
24,000bps FAX/Modem	\$285

Internal FAX/Modems w/MS-DOS 5.0, V.42/V.42bis

14,400bps FAX/Modem, Cellular, Antennae	\$540
96,000bps FAX/Modem	\$490
24,000bps FAX/Modem	\$220

Pocket Modems for any RS-232C Serial Port

14,400bps FAX/Modem, Cellular, Antennae	\$370
24,000bps FAX/Modem	\$180

COMPUTER PERIPHERALS, INC.



PC Magazine says, "The VIVA's data-transfer performance was excellent!"

PC Magazine December 4, 1992

VIVA Internal Modems

14,400bps V.32/V.42 modem, send & receive FAX	\$290
24,000bps with send/receive FAX	\$300

VIVA External Modems

14,400bps V.32/V.42 modem, send & receive FAX	\$380
24,000bps with send/receive FAX	\$395



- 100% compatible in form, fit, and function
- All products user installable
- Installation instructions included
- Toll-free technical support
- Manufacturer's warranties
- Corporate PO's, APO/FPD's welcome
- Government and Educational pricing
- International orders welcome
- Special volume pricing
- 24-hour fax line
- Same day shipping
- Overnight delivery available
- Visa, Mastercard, American Express, and Discover accepted
- No surcharge on credit cards

CALL FOR ANY MEMORY UPGRADE NOT LISTED!

We stock upgrades for over 1700 computers and printers



TOLL FREE FROM THE UNITED STATES AND CANADA

800/824-9866

INTERNATIONAL

714/588-9866

FACSIMILE

714/588-9872

Business hours:
Monday - Friday, 8am-5pm, P.S.T.
Saturday, 9am-3pm, **ORDERS ONLY**



Mail or fax orders to:
First Source International, Inc.
7 Journey
Aliso Viejo, CA 92656
CIRCLE 382 ON READER SERVICE CARD

Terms and Conditions: Inventory products are third party, manufacturer's products are for your convenience. Product charges are non-refundable. An 800 number is required for all orders. All non-defective returns, regardless of reason, or cancelled orders, will be subject to a 20% restocking fee. Prices and availability are subject to change without notice. Purchase price at the time of order are final. First Source International cannot be responsible for errors in typographical or other errors. We will best any advertised price with only no financial benefit, offer and good for 30 days or more. Terms and conditions are of their respective companies.

We'll meet or beat any advertised price!

TOLL FREE 800/824-9866

4element

ORDER IT TODAY...USE IT TOMORROW

PRINTERS

LASER

Compaq All Models	Call
Epson All Models	Call
Hewlett Packard	
Desk Jet 500	435
Laser Jet IV	779
Laser Jet IV	1509
IBM/Lexmark	Call
NEC All Models	Call
Okidata	
OL-400 Par.	578
830+/850	Call
Texas Instruments MicroLaser	880

DOT MATRIX

Citizen All Models	Call
Compaq All Models	Call
Epson	
LQ570	249
AP2250/3250	119/199
Okidata	
320/321	Call
580	449
Panasonic	
2123	261
2124	332
2160	175
2624	395

OTHER

Canon All Models	Call
CoStar All Models	Call
Diconix All Models	Call
Saito Smart Label + Printer	135

POINTING DEVICES

Logitech Mouseman Serial Cordless	\$80
MS Bus or Serial w/Windows 3.1	142

HARD CARDS

Plus Development	
II XL50 MB	\$204
II XL105 MB	265
EZ 127 Int.	318

TAPE BACKUP

Colorado Memory System	
Jumbo 120/250	\$148/209
Tracker 120/250	349/425

CO-PROCESSORS

Cyrix	Call
Intel	Call

VIDEO-BOARDS

ATI	
All Models	Call
Creative Labs Video Spigot	419
Diamond	
All Models	Call

SOUNDCARDS

Advanced Gravis Ultrasound 80	\$127
SoundBlaster	
All Models	Call
Mediasion Pro Audio Spec 16	168

KEYBOARDS

Focus 2001	43
Keytronics KB101Plus	96

OFFICE ON THE GO

LAPTOP

LapLink v.5.0	\$101
Toshiba All Models	Call

NOTEBOOK

Notestar	Call
Panasonic All Models	Call
Texas Instruments All Models	Call



NEW! HAYES ACCURA DATA + FAX MODEMS

Choose the data speed you want - 14,400, 9600, or 2400 bps. V.42, V.42bis, and MNP 2-5 error control and data compression protect your data and improve performance.

Accura 2400 \$57

Accura 9600 \$194

Accura 14,400 \$220

COMPLETE 486/DX-33 SYSTEMS \$1299

TERMINALS

Wyse	
30+	\$275
60+	285
150+ Amber/White	269

COMMUNICATION ALL HARDWARE

Boca All Models	Call
Cardinal All Models	Call
Complete Communicator v3.0	297
Hayes All Models	Call
Intel Satisfaction Model 400	399
Practical Peripheral PM 14400 EXT.	395
Supra All Models	Call
U.S. Robotics All Models	Call
Zoom	
AFX Ext.	67
AMC Int.	39
AMX Ext.	58

DISK DRIVES

Conner Jaguar 170Mb IDE	\$257
Bernoulli	
Insider Pro 80	\$45
Transportable Pro 90Mb	869
Maxtor	
7120A	215
7213A	303
7245A	320
Micropolis All Models	Call
Quantum ProDrive240Mb IDE 3.5"	338
Teac 3.5" 1.44 Mb AT	50
Teac 5.25" 1.2 Mb AT	55
Teac 3.5/5.25" Combo Drive	129
Toshiba 1.2 Mb FDD	59
Toshiba 1.44 Mb FDD	55

OCR/SCANNERS

Complete All Models	Call
Logitech	
Scanman 256	231
Scanman w/ Catchword Pro	271

CD ROM MULTIMEDIA

SMART & FRIENDLY CD ROM

CD ROM Bundle	
Sony 525 w/software	\$331
CD-700 Caddy Less Technology	234
CD-900 Caddy Less Technology	312
CD HS-2200 High Speed Photo CD w/software	499
Floptical 21Mb w/software	312

SONY CD ROM

Photo Ready 31A	Call
Other models	Call

HIGH SPEED CD ROMS

Hitachi CD-3700 (300ms)	\$399
NEC	
CD ROM (280ms)	558
74 Multimedia Gallery Software	
CD s, Sound Card & Speakers	859
Toshiba CD-3401 Multissn/Photo (200ms)	554

MULTIMEDIA SOLUTIONS

Chimen CD-431 Software Bundle	\$390
Creative Labs M.M. Kit	
W/Sound BlasterPro Card	Call
MediaVision M.M.Kit w/NEC 84 & sound card	950
Mediasion Fusion CD-16 w/Sony 31A & sound card	521

NETWORKING & LAN SOFTWARE

FoxPro 2.5 - 8 Pak Upgrade	\$181
Novell Network Lite w/Dr. DOS	52
Other Titles	Call

HARDWARE

Eagle	
NE2000 Ethernet AT	Call
Arbort	
Lantronic AE-2 Ethernet Starter	468
Lantronic AE-2 Net 16B/TP	192
Lantronic AI Net Single Mode	54
Lantronic 2MBPS Adapter	129
NodeRunner	Call
Intel EtherExpress 16TP 10BT	Call
SMC	
Ethercard Plus Elite 16TP	Call
EtherNet - 16Bn Elite	116
EtherNet Combo 16TB	138
Xircom Pocket Adapter PE2-1082	264

DISKETTES

Sony	
3.5 D/S D/D (100)	965
5.25 High Density (100)	71
Tape Backup DD2120/DC2120	17

COMPUTERS

AST	Call
Compaq	Call
IBM Value Point	Call
NEC Ready System	Call

MONITORS

Arche All Models	Call
Arcus 14" SVGA	306
Hitachi All Models	Call
MAG 17F	1082
Mitsubishi All Models	Call
Nano F550 17"	1119
NEC All Models	Call
Sony All Models	Call
ViewSonic All Models	Call
Zenith All Models	Call

GRAPHICS

Corel Draw Comp Upgrade	\$165
Huaka Windows	118

OPERATING ENVIRONMENTS

MS DOS 6.0 Upgrade	\$49.95
MS DOS 6.0 20 User	752
MS DOS 6.0 100 User	3295
MS Windows Ver. 3.1	91
MS Windows Ver. 3.1 Upgrade	45

PROFESSIONAL DESKTOP PUBLISHING

Pagemaker 5.0	Call
---------------	------

DATA BASE MANAGEMENT

MS Access	\$89
Paradox 4.0	525
Paradox for Windows	126
Q&A v4.0	254

WINDOWS

AutoSketch for Windows	\$169
BitFax for Windows v2.0	32
MS Access for Windows	89
MS Excel for Windows	297
MS Excel for Windows Comp Upgrade	118
MS Money for Windows	15
MS Office for Windows/Upgrade	457/344
MS Profit	120
MS Publisher for Windows	120
MS Word for Windows	299
MS Works for Windows	120
Norton Desktop/Windows	117
ProComm Plus Windows	93
Quicken v2.0 for Windows	39
Vision	198
Winsleuth Gold	89
Winspeed	45

INTEGRATED

WordPerfect Works	89
-------------------	----

PERSONAL FINANCE

Quicken v6.0 (DOS)	\$41
--------------------	------

UTILITIES

Fastback Plus 3.1	\$93
-------------------	------

GENERAL

Copy II Option Board Deluxe	\$119
Norton Utilities 7.0	\$115
Optune	54
PC Tools 8.0 DOS	120
QDOS Collection	96
Stacker v3.0	91
Superstor Pro	80
Xbee Gold v2.55	95

MEMORY MANAGEMENT

Gemm 386	\$58
----------	------

MENUING SOFTWARE

Direct Access DOS	\$61
-------------------	------

PRINT

Print Cache 3.1	\$80
-----------------	------

SCREEN SAVERS

After Dark	\$28
Engiziver Bunny	17
Star Trek	35

EDUCATION & GAMES

Bodyworks	\$43
ChessMaster 3000 Windows	35
Kid Pix	35
Mavis Beacon Teaches Typing	28
MS Flight Simulator v4.0	36
Orbits	28
Reader Rabbit II	35
Lemmings	30

BUSINESS

AutoMap (DOS)	\$54
Lotus Organizer	95

SPREADSHEET

CA Supercalc	\$88
Lotus 123 v4.0	332
Quattro Pro v4.0 Comp Upgrade	90

CIRCLE 206 ON READER SERVICE CARD

A DECADE OF EXPERIENCE DELIVERS

SHIPPING

Most orders shipped in 24 hours... with FREE Air Express

You pay the ground shipping, we pay the air difference!

PRICE

A decade of lowest prices on the products you want.

CONFIDENCE

We do not charge your card until we ship your order. 30 Day Money Back Guarantee on all software. No questions asked.

CONVENIENCE

Extended hours: late nights, Saturdays and Sundays.

SELECTION

New versions and products added daily. If you don't see what you need call us and one of our representatives will help you find what you need from our extended price list.

CALL US FOR CUSTOMIZED ACCOUNT SERVICES

International Orders:

1-602-944-3045

Fax 1-602-944-1510

Canada 1-800-752-0590

Purchase Orders:

1-800-521-1970

Dealers/VAR's:

1-800-521-1982

MIT Systems & Networks:

1-800-336-4310

VISA



PCN61333

1-800-521-1973

Arlington Computer Products... Great Prices and Service Since 1984!

- PC Magazine "...Arlington offers worry-free mail order purchasing!"
- PC Sources Product Review "...You can be confident that what you order will work as soon as it arrives!"
- PC Computing Phantom Shopper "...Courteous service and terrific technical support!"

HEWLETT-PACKARD

Laserjet IV w/Toner	\$1389
Laserjet IIP+ w/Toner	\$809
Laserjet IIIP w/Toner	\$889
Laserjet IV L w/Toner	\$689
Laserjet IV SI w/Toner	\$2999
Laserjet IV M	\$1949
1MG Upgrade	\$69
2MG Upgrade	\$99
4MG Upgrade	\$149
Deskjet 500/500C	\$399/509
Deskjet 550C	\$709
Pacific Page/XL	\$269/\$699

Panasonic

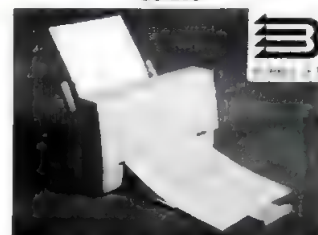
1124I	\$269	2624	\$359
2023	\$199	4410	\$599
2123	\$229	4430	\$859
2124	\$299	4450I	\$1059
2180	\$179	4451	\$1379
1624	\$329	4455	\$1679
4410/4450I 2 MG	\$129		

Canon	
Innova Notebook 386SL-25	
Mhz, 80 MG	\$1359

Canon

BJ-10EX	\$239
BJ-20EX	\$359
BJ-200	\$275*
BJ-300	\$325
BJ-300 Cart.	\$19
BJ-330	\$489
BJC-800	\$1469
BJC-820	\$1599
LBP-4SX	\$669
LBP-8SX	\$1289

BJ-200



*After \$50.00 Rebate - Until 5/30!

EPSON PRINTERS

LX810	\$169	LQ570	\$232	LQ1170	\$569	DFX5000	\$1259	Action 3250 ..	\$189
FX870	\$259	LQ870	\$425	LQ2550	\$849	DFX8000	\$2129	Action 1000 ..	\$619
FX1170	\$345	LQ1070	\$339	EPL8000	\$829	Stylus 800 ..	CALL	Action 1500 ..	\$749

NO SURCHARGE FOR CHARGE CARDS!

OKIDATA

ML320 ..	\$299	ML393 ..	\$909
ML321 ..	\$419	3410 ..	\$1199
ML380 ..	\$209	OL400 ..	\$549
ML520 ..	\$369	OL810 ..	\$909
ML590 ..	\$419	OL830 ..	\$1129
ML591 ..	\$569	OL850 ..	\$1259
OL400 2MB	\$129		

TEXAS INST.

TM 4000/WINSX 120 ..	\$1879
TM4000/WINDX 120 ..	\$2389
TM4000/WINSX Color ..	\$2649
LASER PS17	\$1029
LASER PS35	\$1159
LASER PS35 Turbo ..	\$1399

NETWORKING

Netware 2.2 5 User	\$479
Netware 3.11 5 User	\$569
Netware 3.11 10 User	\$1289
Netware 3.11 20 User	\$1799
Netware 3.11 50 User	\$2599
Lantastic 10BPS Starter ..	\$449
E143 Ethernet	\$185
NE1000 Ethernet	\$99
NE2000	\$135
Ethercard +/-16	\$119/\$139
3 Com EtherLink II	\$185
Intel Ether 16	\$99
Intel Ether 16-5 Pak	\$459
Intel Ether 16-20 Pak	\$1669
Intel Token Express	\$479
Irma Board 3	\$399

SCAN. & DIGIT.

Epson 600C	\$779
Epson 800C	\$1069
Logitech ScanMan	\$135
Logitech ScanMan 256 ..	\$239
Mustek Gray Artist	\$159
Mustek Color Artist	\$289
Summasketch 12x12	\$259
Summasketch 12x18	\$509

NEC

P3200/3300	\$225/\$325
P6200/6300	\$399/\$599
P9300	\$825
Model 95 Pscript Laser ..	\$1349
Model 95FX Laser	\$1649

MONITORS



NEC

3 FGE	\$579
4 FGE	\$689
5 FG	\$1245
5 FGE	\$1059
6 FG	\$2249

MITSUBISHI

EGA	\$239
Diamond Scan 4533C ..	\$429
Diamond Pro 17	\$1059
HL6955 20"	\$1779

PANASONIC

1381 VGA 1024x768	\$319
1395 VGA 1024x768	\$429
1991 VGA 1280x1024	\$1539

SAMSUNG

14" Sync Master 2	\$249
15" Sync Master 15	\$479
17" Sync Master 4	\$759

VIDEO BOARDS

ATI VGA Wonder 1MG ..	\$139
ATI Graph Ultra + 2MG ..	\$299
ATI Graph Prof 1 MG	\$409
ATI Graph Prof 2 MG	\$479
Sound Blaster Prof	\$169
1024 VGA 16 Bit 1 MG ..	\$79

MODEMS

Hayes Accura 96/Fax	\$219
Hayes Accura 14.4/Fax ..	\$245
Hayes 2400 Optima	\$119
Hayes Optima 96	\$309
Hayes Optima 14.4	\$359
Hayes Optima 14.4/Fax ..	\$369
Hayes Ultra 96	\$539
Hayes Ultra 14.4	\$589
Practical Per. 2400 Int.	\$69
Practical Per. 2400 Ext.	\$99
Practical Per. 9600 Int.	\$169
Practical Per. 9600 Ext.	\$179
Practical Per. 14.4 Int.	\$185
Practical Per. 14.4 Ext.	\$199
US Robotics 9600	\$489
US Robotics Dual Std	\$709
US Sport 14.4 Ext. Fax	\$199
US Sport 14.4 Int. Fax	\$179

intel.

SatisFAXtion MODEMS

100 2400/9600 Fax	\$99
200 2400 V.42/9600 Fax ..	\$275
300 14.4/9600 Fax	\$219
400 14.4/14.4 Fax	\$369
400 Ext 14.4/14.4 Fax	\$379
Faxability Plus/OCR	\$159

CHIPS

256K/1 MG Chips each	\$3/\$5
256K/1MB Simms	\$15/\$39
4MB Simms	\$139
Epson Action 2 MG	\$109
HP 2MG Upgrade	\$99
HP 8MG Upgrade	\$269
Intel ISA 2 MB	\$299
OKI Laser 2MB	\$129

intel.

80287-10XL/XLT	\$79
80387 SX-16/20/25	\$75
80387 SL	\$75
80387-16/20/25/33	\$85
Overdrive SX20/25	\$309/\$425
Overdrive SX33	\$549
Overdrive DX25/33	\$425/\$549

SOFTWARE

Aldus Pagemaker	\$489
Corel Draw	\$389
Lotus 123 2.4/3.1	\$325/\$389
Microsoft Excel Wndws ..	\$299
Microsoft Windows 3.1 ..	\$69
Microsoft DOS 5.0	\$79
Microsoft DOS 6.0	\$69
PC Tools 8.0	\$119
Quicken	\$49
Word Perfect 5.2	\$259
Word Perfect Windows ..	\$259

DRIVES & TAPES

Ext. 1.2 for PSII	\$159
Toshiba 3 1/2" 1.44	\$69
Colorado Jumbo 120	\$145
Colorado Jumbo 250	\$199
Colorado Trakker 120	\$339
Colorado Trakker 250	\$395
lomega 250	\$199
Irwin 120/250	\$169/\$199
Irwin Parallel 250	\$409

AMERICAN UPS

250	\$109	600	\$259
400	\$159	900	\$375
450	\$189	1250	\$729

CD ROM OPTICAL DISKS

Media Fusion CD-16	\$499
Media Vision Pro 16	\$979
NEC CD Express	\$409
Sony CDU 535 Int.	\$279
Sony 7205N Ext.	\$455

SEAGATE HARD DISKS

40 MB for AT (ST251-1) ..	\$229
80 MB for AT (4096)	\$279
106 MG 3120A	\$179
120 MG 3144A	\$189
245 MG 3283	\$299

PLUS HARD CARD

85 MB/127 MB	\$259/\$309
170 MB/240 MB	\$359/\$519

CONNOR HARD DRIVES

120 MB/174 MB	\$219/249
209 MB/540 MB	\$299/\$899

CIRCLE 338 ON READER SERVICE CARD

Arlington
Computer
Products, Inc.

1870 CARBOY
MT. PROSPECT, IL 60056

ISA CRUISE & CLUTTS



800-548-5105

CUSTOMER SERVICE AND INQUIRIES 708-228-8333
TECHNICAL ASSISTANCE 708-228-9748
Fax 708-228-0514

COMPUCLASSICS

YOUR SOURCE FOR SOFTWARE

FREE GROUND SHIPPING

ON ALL PRODUCTS OVER \$50

- Over 9 Years Serving you
- Overnight Shipping Available
- 24-Hour FAX Order Line
- Int'l, APO, FPO, Gov't and Educational Orders & POs Accepted

- Visa, MasterCard, Amex & Discover (No Surcharge on U.S. Orders)
- Corporate POs Welcome
- No Minimum on Individual Orders

ACCOUNTING			WMS Office For Windows 3.0			W On Target 1.0		
Managing Your Money 9.0	39	W Fonts On The Fly 2.0	265	WMS Office For Windows Upgrade 3.0	389	W Timeline For Windows Upgrade	195	
Quicknet 6.0	139	W Framemaker Competitive Upgrade	315	LANGUAGES/PROGRAMMING				
W MS Profit	64	W InfiType Plus	39	PC Tiball II	119	Lotus 1-2-3 4.0	309	
W MYOB Accounting For Windows 3.0	115	W MS Printing System For Windows	135	MS Fortran Compiler 3.1	99	Lotus 1-2-3 Upgrade 2.4 or 3.4	109	
W Peachtree Accounting For Windows	79	W MS True Type Font Pack	52	MS Visual Basic Dev Standard	135	Quattro Pro 4.0	99	
W Quicken For Windows	44	W Omnigrip Professional 2.1	565	Object Professional Turbo Pascal 1.14	129	W Lotus 1-2-3 Win Comp. Upgr 1.1	109	
BUSINESS PRODUCTIVITY			580	Turbo C ++ 3.0	72	W MS Excel For Windows 4.0	309	
W Act! For Windows	255	W Print Shop Deluxe Windows	49	Turbo C Tools	103	W MS Excel For Win Comp. Upgr 4.0	127	
W Autotrap For Windows	54	W Quark Express	575	W Borland C ++ .1	149	W Quattro Pro Windows	99	
W On Time For Windows	73	W True Effects For Windows	39	W CA Realizer	79	STATISTICS/SCIENTIFIC		
W Packet 5.0	245	W Ultrascript PC	112	W MS C++ Upgrade 7.0	139	BrainMaker 2.5	142	
CALL			559	W MS VB Win Comp. Upgrade 2.0	99	Derive 2.55	135	
AutoSketch 3.0	95	EDUCATION			199	Mathematek 386 w/387 Support 2.1	749	
Autosol Simulator	179	55	Businessworks	49	W MS Visual C++	335	Sigma Plot 5.0	435
Design Cad 3D 4.0	250	W Knowledge Adventure V2A (Ages 9+)	45	W MS Visual C++ Prof Comp Upgr	139	Statgraphics 6.0	699	
Gencom Cadd 6.0	289	W Mavis Beacon Teaches Typing	37	W MS Visual C++ Standard	135	Statistica	635	
Office Layout	99	W New Math Buster Plus (Ages 6-12)	32	W Turbo C ++ For Windows 3.1	109	Surfer	359	
W Autodesk for Windows	185	99	Orbita	39	W Turbo Pascal for Windows 1.5	109	Systat 5.0	719
W Manners Upgrade	59	39	PC Glob 5.0	39	MULTIMEDIA/CD ROM			
COMMUNICATIONS			55	W Autodesk Multimedia Explorer 1.25	125	W Grapher for Windows	169	
Carbon Copy 6.1	135	55	Where In The World Deluxe (VGA)	49	W Mathematica 4 For Windows 3.1	835	W Mathematek 4 For Windows 2.1	325
Close Up Dual Pack (Customize)	129	35	Your Personal Trainer for the S.A.T.	35	W Statistics 4 For Windows	779		
Laplink Pro 5.0	109	55	W Typing Tutor 5+ For Windows	35				
PC Anywhere (Host & Remote) 4.5	119	ENTERTAINMENT						
ProComm Plus 2.01	74	45	W MS Beethoven: The Ninth Symphony	39	SCO Unix Oper Sys 386 (2 Users) 3.2.4	429		
W Bitstar/Bricom For Windows	45	29	W MS Encarta	276	SCO Unix Oper Sys 486 (16U) 3.2.4	929		
W CC Mail Win Platform Pack 1.11	359	35	W MS Encarta Encyclopedia	276	UTILITIES			
W Carbon Copy For Windows	135	46	W MS Musical Instruments	59	386 Max 6.02	64		
W Comshare For Windows 2.0	119	42	W MS Word for Win & Bookshelf Upg	99	Mac In-Dos	60		
W PC Anywhere Win (Host & Remote)	119	45	Memorix Notes	65	Norton Desktop For DOS 1.0	85		
W ProComm Plus for Windows	105	45	PC Karaoke	78	Norton Utilities 6.0	115		
W Reflection 2 Windows	239	49	Sherlock Holmes Consulting Detective 1	46	PC Tools 4.0	132		
W Winlisp Pro 3.0	82	52	W Street Atlas USA	99	QDOS 3	49		
Harves Opt 144 + Fax 14.4 Packet Est	529	45	W The Animals (San Diego Zoo)	72	QEMM 3.11	62		
Intel Satisfaction 400 Internal	429	43	W The Sleeping Beauty (MPC)	36	Stacker 3.0	85		
Prac 9624 Send/Receive Fax Modem Int	99	39	W World Atlas 3.0 (MPC)	62	XTree Gold 2.5	99		
Quicktel 9624 Fax Modem Internal	124	39	W World Atlas 3.0 (MPC)	62	W Afterdark For Windows 2.0	32		
Remote Power On/Off	124	42	CD ROM Internal Kit Creative Labs	399	W Dashboard for Windows	49		
Teletex QBlazer Mod 9600	299	209	Pro Audio Spectrum 1.6	209	W Dr Solomon Anti Virus Windows	89		
W 32V 4285	215	165	Senat & Friendly IS 2320 Int	579	W Norton Antivirus For Win Dots 2.1	89		
Zoom 14.4 Int. Fax/Modem	122	142	Senat & Friendly PC2 7001 CD ROM	252	W Norton Desktop For Windows 2.0	119		
Zoom 9624 Fax/Modem Int Win/Van	122	59	Sound Blaster 16 ASP	245	W PC Tools For Windows 1.0	145		
DATA BASES			345	Sound Blaster Professional	192	W Ready Aim File For Windows	65	
AlphaFour Competitive Upgrade 2.1	99	251	Soundblaster Multimedia Starter Kit Int	469	W Star Trek Screensaver	19		
Buener 2.0	259	SOFTWARE WORKING			W Winspeed	62		
CA-Clipper Comp Upg 5.2	149	172	Lantastic 2MBPS Starter Kit 4.1	359	W Xbase for Windows	69		
DOE For Clippers 4.2	149	109	Lantastic AE-2 Ethernet Adapter 4.1	215	Language Assistant Each 5.0	59		
Mouse 1.5	499	125	Lantastic AE-2 Ethernet Starter Kit 4.1	489	Globalink Power Translator	179		
MS Foxpro Comp Upgrade 2.5	339	134	Novell Netware 3.1	CALL	Wordperfect	5.1	289	
MS Foxpro Single User 2.5	339	189	Novell Netware 4.0	CALL	W Ami Pro Competitive Upgr 3.0	105		
Q & A/Anation Desktop For DOS 196	150	65	Xarcem External Ethernet Adapter	425	W MS Word For Windows Upgrade 2.0	127		
Q & A/Relationl Rep Writer Xbase 5.0	175	102	WMS Win For Workgroups Upgr 1.1	102	W Wordperfect 5.2 Comp Upg	105		
W Approach for Win Comp Upgrade	99	OPERATING ENVIRONMENTS			W Wordperfect 5.2 For Windows	289		
W Filemaker Pro	272	272	Desktop/Win	175	HARDWARE			
W MS Foxpro Windows 2.5	339	149	IBM OS/2 2.0	42	386/486 Math Co Processor	85		
W MS Foxpro Win Comp. Upgrade 2.5	339	109	MS DOS 6.0 Upgrade	49	Intel 80387 DX Co processor	92		
W Paradox for Windows (Int'l)	139	125	W HP New Wave 4.1	79	Scanman 256 W AutoScan	252		
W Paradox/Windows/Quattro Pro Win	199	129	W MS Powerpoint For Windows Upgrade	149	Bernoulli Transpore 90MB Drive	729		
W Superbase Competitive Upgrade	195	579	W Micrograph Designer Win/ATM 3.1	579	Handa and TZ 240MB IDE	579		
DESIGN/PUBLISHING			319	Dr. Schuler's Home Media Advisor	49	Junio Tracker 250MB Parallel	409	
Br Design	50	109	W Inkscape For Windows	99	ATI Grip Ultra Pro/VR - 260x1024	475		
Morelans 1.01	75	109	W Lotus Organizer 1.0	125	Canon B Mouseman/Netrus Bus	75		
W By Design for Windows	50	INTERNET/GRAPHIC			MS Sena Mouse Win/Trial Penstyl	82		
W Express Publisher For Windows	105	369	W MS Project for Win Comp Upgr 3.0	199	Canon Bubble Jet 200	129		

THIS IS JUST A SAMPLING OF THE 10,000 TITLES WE CARRY

Visio

BIZKIT Plus.

Everyone can use Visio's intuitive drag and drop drawing technique—you don't have to be a graphic artist or draftsman. Drawings practically draw themselves. With its straightforward stencils, simplified tool set, and commonsense approach to drawing, Visio gives you professional-quality graphics the first time you sit down to draw.

Powerful, Easy to Use Templates for All Business Needs. Accounting, Business Planning, Forecasting Cash Flow, Inventory Control, Mail-List Merge, Payables, Receivables, Sales Management and More! In One Low Cost Software.

BizKIT Plus

Visio \$199

\$149

WE SPECIALIZE IN INTERNATIONAL ORDERS

800-735-1993/818-347-7500/FAX 818-347-9977

CIRCLE 206 ON READER SERVICE CARD

SPECIALS

Winslueth Gold \$85
Stanford Graphics \$319

FrameMaker

FrameMaker is the leading document creation and distribution software for creating business and technical documents. FrameMaker combines full-featured WYSIWYG word processing, graphics, page layout, equations editing, hypertext and structured document tools in one, easy-to-use application. FrameMaker is available on all major platforms and is file compatible across all of these.



Full \$499
Upgrade \$309

CA-CLIPPER VERSION 5.2

Special upgrade offer to all database and application development software users. Buy CA-Clipper Competitive Upgrade, and receive your choice of CA-Clipper Tools III, CA-Clipper/Compiler Kit for dBase IV or CA-Dblast 2.0 directly from CA at no extra charge when you register!



\$149

CorelDRAW 4

The best in graphics...and MORE! CorelDRAW 4 lets you create dynamic illustrations and charts, edit photos, produce on-screen presentations and now offers a complete animation module! Trace business forms in one simple step with powerful OCR, CorelDRAW 4 also includes 750 fonts and more than 17,000 clip-art images, multi-page layouts, fractal textures and new "Powerlines".



Full \$399
Upgrade Call

COMPUCLASSICS

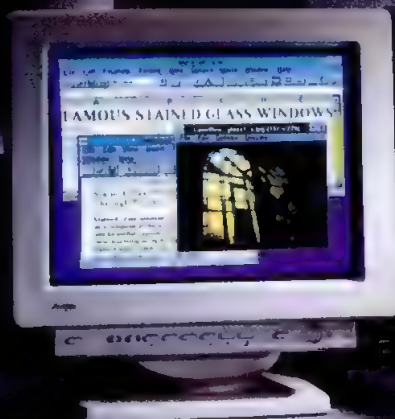
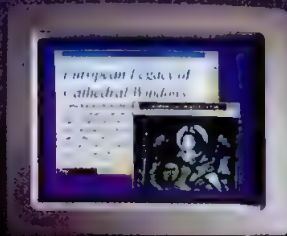
P.O. Box 10598, Canoga Park, CA 91309
Showroom: 7959 Deering Ave., Canoga Park, CA 91304

CALL US FOR PRODUCTS NOT LISTED
PLEASE SPECIFY DISK SIZE WHEN ORDERING
Air shipping charges \$7.00 per order. * Over \$50 and up to 10 lbs. \$1.00 per pound above 10 lbs. only in the Continental United States. Defective software will be replaced immediately. Your credit card will not be charged until your order is shipped. We ship latest versions. Delivery guarantee only applies to in-stock items. Alaska, Hawaii, Puerto Rico, Int'l. FPO/APO call for shipping charges. Restocking fee on non-defective items. Prices subject to change without notice. We accept VISA, MasterCard, Discover, JCB and American Express. Please call (818) 347-9400 for an authorization number on returns. \$5.00 C.O.D. charge. Order desk open 7 am to 5 pm Monday through Friday (PST), Saturday 10 am to 2 pm. 24-Hour FAX Order-Line.

W Indicates Windows Products

If It's Time To Upgrade, It's Time To Move Up To Amdek!

- Full Family of Display Products
- Toll-Free Direct Sales Number
- Toll-Free Technical Support Line
- Toll-Free Service Number
- 30-Day Money Back Guarantee*
(No restocking fee)
- Corporate Account Evaluation Program
- Special Fortune 1000 Program
- ISO9001 Certification of quality



Regardless of whether you are upgrading from your current PC monitor solution, adding a monitor for your notebook or just need your first monitor, you should really consider the full family of monitors from Amdek. Amdek has been successfully providing quality PC monitor solutions for over fourteen years. Today's Amdek solution provides a broad choice of competitively priced, non-interlaced 14", 15" or 17" low radiation displays with

front panel controls in a range of resolutions (VGA, SVGA or High Resolution). Call us and we will give you the name of the reseller nearest you or you can make your purchase from Amdek "Direct" - your choice! The best combination of great prices, proven support and immediate availability from a company with over fourteen years of experience! Give us a call at 1-800-72-AMDEK. It really is time for you to move up to Amdek!

Amdek Family of Non-Interlaced Displays

	AM/432N	AM/732C	AM/732E	AM/814LC	AM/814	AM/815	AM/817
Resolution	640 x 480	640 x 480	800x600NI	1024x768 NI	1024x768 NI	1024x768NI	1280x1024NI
Screen Size	14" FS	14"	14"	14"	14"	15" FS	17" FS
Max Refresh Rate	60 Hz	60 Hz	60Hz	60 Hz	72Hz	72Hz	72Hz
Dot Pitch	—	.31mm	.28mm	.28mm	.28mm	.28mm	.26mm
*Unit Price (1)	\$105	\$269	\$299	\$349	\$389	\$489	\$889
*Unit Price (2-9)	\$102	\$263	\$292	\$341	\$380	\$477	\$868
*Eval Price	\$92	\$229	\$259	\$289	\$323	\$399	\$749

To Order Call Toll Free:
800-72-AMDEK
Call For Volume Discounts

AMDEK
VALUE THROUGH THE YEARS

*Available with products purchased from Amdek "Direct". We accept Visa, Mastercard, or cashier's check. Trade accounts are available with credit limits and terms. Shipping, handling, and applicable sales tax not included in the price. All prices, offers and specifications are subject to change without notice. Any return being shipped to an Amdek location will require an RMA (Return Merchandise Authorization) number. Original packaging and proof of purchase required to return any merchandise. Amdek is a registered trademark of Wyse Technology Inc. All other trademarks are the property of their respective owners and are used for identification purposes only. © 1993 Wyse Technology Inc.

CIRCLE 165 ON READER SERVICE CARD

H.Co. has America's largest selection of memory products, and we'll beat any USA advertised price!

**All Products 100%
Guaranteed!**

80386SX 33	79.00	386SX 25MHz.....	\$195.00
80386SX 25/20	77.00	386SX 33MHz	215.00
80287 20	71.00	486 33MHz	629.00
		486 50MHz (SLC)	399.00

Part #	Price		
803870X	\$95.00		
80386SX	87.00		
80387SL	87.00		
80287X XLT	72.00		

	Kingston upgrade	1mb incl
	Kingston upgrade	2mb incl
	Kingston upgrade	4mb incl

HP Laserjet II, IID, IIP, III, IID	2MB BD	\$99 00
	4MB BD	158 00
HP Laserjet IIIi	4MB MD	146 00
	8MB MD	295 00
HP Laserjet 4	2MB MD	95 00
	4MB MD	162 00
	8MB MD	299 00
HP Deskjet 500, 500C, 550C	256K MD	59 00
IBM 4019, 4019e	2MB MD	119 00
	3.5MB MD	189 00
IBM 4029	2MB BD	89 00
	4MB BD	129 00
OKI Laser 400	2MB MD	99 00
OKI Laser 800 820	2MB MD	129 00
	4MB MD	199 00
Panasonic 4420 4450i 4410 4430	2MB MD	119 00
	4MB MD	189 00
Panasonic 4455	2MB MD	159 00
Epson EPL6000	2MB MD	99 00
	4MB MD	189 00
Epson EPL 7500	2MB MD	145 00
	4MB MD	225 00
Epson Action Laser II	2MB MD	149 00
	4MB MD	229 00
Canon LBP III IIIPlus	2MB BD	239 00
	3MB BD	289 00
Canon LBP-4	2MB BD	165 00
TI MicroLaser XL	1MB MD	49 00
	4MB MD	229 00

1X9-80	\$37 00	2X8-80 (MAC) ..	\$67 00
1X9 70	38 00	4X8 70 (MAC) ..	132 00
1X9-60	41 00	16X8-70 (MAC) ..	549 00
1X3 70	36 00	512X36 80	90 00
4X9-70	135 00	1X36-80	169 00
1X8 80 (MAC) ..	34 00	2X36 70	309 00
1X8-70 (MAC) ..	35 00	4X36-70	589 00

AST		IBM	
Bravo 486/25	2MB KIT.....\$110.00	502.55SX,LS.65SX,LS.70-E61.70-121.P-70	1MB MD.....\$50.00
	8MB KIT.....287.00		2MB MD.....80.00
Bravo 4/660,50d,33,33s,25s	4MB MD.....145.00	55SX,LS.65SX,LS	4MB MD.....149.00
	8MB KIT.....289.00	70-A21.70-A61.70-B21.70-B61	
	16MB MD.....619.00		2MB MD.....80.00
Prem 386/SX 16, 20, 25, 33	8MB KIT.....289.00	30/286	2MB KIT.....80.00
Prem II SX/33, 25, 20, 16	1MB KIT.....55.00	PS/1 286, 386SX	2MB UPG.....90.00
	4MB KIT.....149.00	80-0401	1MB BD.....79.00
	OMB BD.....219.00	80-111.31	2MB BD.....99.00
Cupid Exp.		80-A21,A31,A61	4MB MD.....149.00
Prem 386c Wkst&Bravo 286	4MB KIT.....179.00	57.57SX,90.95,PS/1 Pro	
			4MB MD.....135.00
			8MB MD.....289.00
		70,80	4-16MB BD.....309.00
		50 & 60 SERIES	4-16MB BD.....309.00

NEC		
PM SX/SX PLUS	2MB BD	\$219 00
	4MB BD	279 00
	8MB BD	519 00
PM SX/20	2MB CPU UPG	169 00
	2MB UPG EXP	209 00
	2MB UPG KIT	89 00
PM SX/16	2-8MB BD	189 00
	2MB UPG KIT	85 00
PM 386/20, 25	2MB MD	299 00
	8MB MD	699 00
PM 386/25	8MB REP BD	999 00
PM 386/25S	2MB KIT	159 00
	8MB KIT	499 00
PM 386/33E 486/25E	2MB MD	199 00

IBM		
50Z.55SX,LS.65SX,LS.70-E61,70-121,P-70	1MB MD.....	\$50.00
	2MB MD.....	80.00
55SX,LS.65SX,LS	4MB MD.....	149.00
70-A21,70-A61,70-B21,70-B61	2MB MD.....	80.00
30/286	2MB KIT.....	80.00
PS/1 286 386SX	2MB UPG.....	90.00
80-041	1MB BD.....	79.00
80-111,31	2MB BD.....	99.00
80-A21,A31,A61	4MB BD.....	149.00
57.57SX,90.95,PS/1 Pro	4MB MD.....	135.00
	8MB MD.....	289.00
70.80	4-16MB BD.....	309.00
50 & 60 SERIES	4-16MB BD.....	309.00

H.Co. is open weekends for your convenience.

See H.Co.

At
COMDEX/Spring '93

Booth # 1274

May 24-27, 1993

Georgia World Congress Center
Atlanta, Georgia

TOSHIBA	
T1200SX, T1600, T1800	4MB \$169 00
	8MB 319 00
T3100SX, T3200SX/SXC	2MB 89 00
	4MB 149 00
T1200XE, T1600, T3100E	2MB 89 00
	3MB 149 00
T3200	2MB 89 00
T5100	2MB 89 00
T5200, T5200C, T8500SL	2MB 89 00
	3MB 149 00
T4400, T8400, T3300SL	2MB 139 00
	3MB 199 00
T3300SL	6MB 395 00
T4400, T8400	3MB 359 00
	1MB 99 00

Model	RAM	Price
L40SX N51	2MB	\$109 00
	4MB	149 00
	8MB	295 00
CL57SX Thinkpad	4MB	349 00
	8MB	659 00
PS Note	2MB	169 00
	4MB	269 00
	8MB	469 00

COMPAQ	
Portable III	2MB \$129.00
Centura 3/20,25	4MB 197.00
	8MB 419.00
LTE 386S/20	4MB 199.00
LTE Lite/20,25,25c	4MB 229.00
	8MB 395.00
LTE Lite 4/25c	4MB 249.00
	8MB 399.00
SLT 386	2MB 149.00
	4MB 199.00

NEC		
UltraLite III.SL/25c	2MB	\$149.00
	4MB	249.00
UltraLite SL/20.SL/25c	2MB	149.00
	6MB	297.00
Prospect 386SX-16.286	1MB	109.00
	4MB	207.00
Prospect 386	2MB	147.00
	8MB	449.00

ZENITH		
Z-Note	2MB	\$169.00
	8MB	489.00
Z-Sport	2MB	129.00
MastersPort SL SLC SLE	2MB	109.00
MastersPort 386SX	2MB	119.00
SupersPort SX 286e	2MB	139.00
SlimsPort	2MB	139.00
	4MB	279.00
SupersPort 286 286e	1MB	99.00
SupersPort 286e	4MB	279.00

OTHERS		
Ti TravelMate 2000	1MB	\$89 00
Ti TravelMate 3000	2MB	95 00
Ti TravelMate 4000	4MB	219 00
AST PremExec	4MB	135 00
AST PowerExec SL, EL	4MB	179 00

Apple Powerbook (All) Call for current prices

All H.Co. Manufactured Memory Products Carry A Lifetime Warranty!

Call H.Co.'s Memory Experts Toll Free

1-800-RAM-CHPS or 1-800-726-2477

Place your order by 4pm (PST) and we'll ship it today



H.Co. Computer Products, Inc.
17922 Skypark Circle Suite F
Irvine, CA 92714
Office: 714-833-3222
Tech Support: 714-833-3364
FAX: 714-833-3389

PO'S ACCEPTED FROM UNIVERSITIES, GOVERNMENT AGENCIES, AND QUALIFIED FIRMS

TERMS:

- 1 VISA MC AMEX Discover C.O.D. Pre-paid and Approved PO's only
- 2 FAX orders and international orders accepted
- 3 15% Restocking fee on returns within 30 days. No refunds after 30 days
- 4 All returns require an RMA number sorry no software returns
- 5 All credit card purchases are verified for your protection

[illegible]

CIRCLE 31 ON READER SERVICE CARD

48 Hour Shipping!

1-800-438-6039

3COM

3C503 Etherlink II/ 5-pack	185/750
3C503TP 10 Base T	229
3C507 Etherlink 16	279
3C523 MCA Ethernet	299
NEW! 3C619	279
NEW! 3C509	149
ARTISoft	
Starter Kit 2mbps/AE2	325/440
Starter Kit AE3	539
Lan Cards 2mbps/AE2	129/199
Lan Card AE3	229
Central Station	419

INTEL

Ether Express 16/16TP
Token Express 16/4 ISAMCA
EtherExpress EISA

NOVELL

NE1000/NE2000	98/129
NE 3200	659
Novell Lite 1 1/starter kit	60/409
Network 2 2 5/10 User	509/1079
Network V 2 2-50 user	2199
Network 3 11 5/10 User	509/1399
Network 3 11-50 User	2739
Network 3 11-100 User	3775

5MC

PC130/PC130E	75/95
PC600WS/PC600FS	120/270
Ethercard 8 bit/16 bit	119/139
10 Base-T Card 8 bit/16 bit	145/165
3608TP 10BT concentrator	379
3512TP Ether 10BT conc 12 port	669

XIBCOM

**CALL FOR OTHER
NETWORK PRODUCTS**

Network Software

Borland D Base IV LAN-1 user	279
Lotus 2 4 server/node	550/339
Lotus 3 1 server/node	625/409
Norton PC Anywhere V 4 5 Lan	325
Peachtree Network Accounting	295
Word Perfect additional nodes	179

Software

Aldus Pagemaker	489
Carbon Copy/Close Up	129/149
Claris Pro Developer	CALL
Clipper 5 2	449
Corel Draw	365
Dbase IV	409
FoxPro 2 5	309
Frememaker	549
Freelance Plus	309
Harvard Graphics	369
Lotus 2 4/3 1 +	285/339
NEW! Lotus 3 4	349
Lotus for Windows	415
Smart Suite Bundle	449
MS DOS 6 0	IN STOCK
Microsoft Windows 3 1	89
Microsoft Windows for Workgroup	CALL
Microsoft Access 1 0 for Windows	CALL
Microsoft Excel 4 0 for Windows	309
Microsoft Word for Windows	289
Norton Desktop for Windows	119
Norton Utilities 7 0	115
Norton AntiVirus	80
Peachtree III Complete DQ	189
Paradox v4 0	BEST PRICE!
Q&A 4 0	219
Quattro Pro	299
Ventura Desktop Pub	BEST PRICE!
Winfax Pro	89
Word Perfect 5 1	CALL
Word Perfect 5 2 for Windows	CALL

DON'T SEE WHAT YOU NEED?
PLEASE CALL!

CANCN

Notetel 488	CALL
TEXAS INSTRUMENTS	
4000 SX25 W/120	1939
4000 DX25 W/120	1959
4000 DX25 W/200	2559
4000 DX2/50 W/200	2959
MITAC	
386 SL25, 2mg 60mg/60mg/119g/129g	
486 SL33, 4mg 80/120mg	1730/1849
EPSON	
NBSL-20/25	1525/1775
w/ 60/60/120 MB HD	209/542/776

Monitors

NEC MULTISYNC	
3FGX45FG	629/755
PANASONIC	
13811/1395	814/420
NEWI C1745E	1382
SAMSUNG	
Syncmaster 3 14" 1024 x 768	289
Syncmaster 4 17" 1024 x 768	740
Syncmaster 15 15" 1024 x 768	476
CTA	
5400/5400M	289/325
1760 17" SVGA	815
HANA O	
F5501/T580i	1149/1789
NEWI F340i	720
VIEW SONIC	
6E/6FS7	349/559/999
15/17/20	660/1225/1915

Video Cards

ATI	
Graphics Ultra + 1 meg	299
Graphics Ultra Prof w/ 1 mg	439
Graphics Vantage w/ 1 mg	229
VGA Integra 512K	89
BOCA	
Basic VGA	CALL
Super VGA 1 mg	CALL
Super VGA 1 mg 16.8 ml colors call	
DIAMOND	
Diamond Speedstar 24x w/ 1 mg 16.8	
ORCHID	
Prodesigner IIS/EISA w/ 1 mb	379
Prodesigner IIS w/ 1 mb	189
Orchid F1280 w/1 mg	159

Modems & Fax

BOCA		
14 fax modem in/ext	229/265	
CARDINAL		
2400 INT/EXT	55/75	
2400 INT/EXT w/MNP	80/99	
9600 INT/EXT	129/265	
96/24 INT Fax/modem	79	
HAYES		
Optima 96	111	
Optima 14 4 EXT/fax	389	
INTEL		
Satisfaction 400/400E	399/450	
PRACTICAL PERIPHERALS		
FAX ME	165	
PM 14400 FXPPM Pocket Mod	350	
PM 14400 FXMT ext v 32 b/s	CALL	
PP 9600 in/ext	CALL	
US ROBOTICS		
Sportster 9600 in/ext	CALL	
Sportster 14 4 fax/mod in/ext	CALL	
Copner HST Dual 16 B	759	

Printers

CANON

BJ10ax/200	245/325
BJ300/330	325/500
LBP-4ax laser	909
LBP-8ax laser	1309
DICOMIX	
180u: inkjet	239
701 inkjet	375
EPSON	
AP 2250/3250	155/190
FX870/FX1170	265/349
LQ570/LQ1070	235/349
LQ870/LQ1170	425/575
LQ2550	849
LX810	169
EPL8000 laser	649
EP 83000/1000	1269/2139
Action Laser 1000/1500	659/745
HEWLETT PACKARD	
Laserjet IV w/ toner	1369
Laserjet IIP w/IIIP	759/895
NEW! HP IVa:	CALL
Desk Jet 500/500c	379/509
Desk Jet 550c	609
OKIDATA	
ML184/380	229/219
ML320/321	309/425
ML590/591	429/579
393/393c	919/979
laser 400/810	569/1064
830c/850 NEW!	1149/1269
PM3410	1299
NEC	
Silentwriter 95fx	1599
Silentwriter 67	1829
PANASONIC	
2023/1124i	CALL/275
1824/1654	339/539
2180/2123	175/255
2124/1695	319/609
2824 24 pin wide	379
4410/laser/4430	839/1079
4451/4455	1399/1719

LASER ACCESSORIES

Upgrade for HP 1 mb	79
Upgrade- HP 2mb/4mb	109/179
Pacific Data 25-N-1	249
Pacific Page PE/PEXL	call 699
Pacific Connect XI	call
Complete Font Library	249
Font Bank Cartridge 1.5 Mb	289

Mice & Misc

Epson ES800C/800C scanners	CALL
Microsoft Mouse w/Windows 3.1	149
Microsoft Ball Point Mouse	118
Logitech Scan Man 256 w/ OCR	319
HP Scanjet IIP w/interface	919
HP Scanjet IIC w/interface	1459
Soundblaster Pro 16	CALL
AMERICAN POWER	
Back-ups 250/400/450	109/169/189
Back-ups 600/900	279/389

Bulldog Systems

Bundog's Standard Configuration
Dual Floppy Drives • Super VGA Card
with 1 Mg • 14" SVGA Monitor (1024
x 768) • DOS 5.0 • Windows • Mouse
• 1 year warranty!

386SX-33 w/2MB w/ 40 Mg	879
386DX-40 w/4MB w/ 130 Mg	1225
486SX-25 w/4MB w/ 130 Mg	1350
486DX-33 w/4MB w/ 245 Mg	1875
486DX-50 w/8MB w/ 245 Mg	2045
486DX2-66 Local Bus w/ 8MB w/ 245Mg	

Call for other configurations

Drives

CONNER		
40mg IDE/85mg IDE	149/209	
120mg IDE 3.5-200IDE 3.5	245/330	
254 mg IDE	318	
IONMGA		
90 MB Insider/Transportable	579/689	
Dual 90 ext	1498	
NEW! B! Bonolux Multidisk 150	349	
Tape 250 mg insider	289	
Tape 250 mg ext	319	
2135 Mfloptical insider	335	
MAXTOR		
7120A 130 IDE	259	
7213 A 210 IDE	319	
7213 A 245 IDE	335	
QUANTUM PASSPORT XL removable		
120MB/240MB	699/899	
SEAGATE		
ST3098A/3144A	209/259	
ST2838A 245mg IDE	499	
FLOPPY DRIVES		
1.2MB/1.44MB	59	
Micro Solutions 1.2MB/1.44MB	159	

Tape Drives

IRWIN	
Accutrak 120+/250+	175/229
Accutrak 250 Export	435
COLORADO MEMORY SYSTEMS	
DJ10 120 Meg Int Jumbo	185
DJ20 250 Meg Int Jumbo	219
Trakker 120/250	339/429
MICRO SOLUTIONS	
80/250 Backpack	419

Memory Boards

AST	Six Pack 286 w/OKAT	95
INTEL	ISA w/ OK	179
ORCHID	Ramquest 8/16 w/OK XT/AT	129
ROCA	ROCA CARDS	CAL

MathCo

INTEL
387 SX or DX
OVERDRIVE SX20/25/DX25/33 - CALL
CYRIX 387SX
387DX33/40



P.O. Box 1459 • 610 Industrial Park Drive
Evans, Georgia 30009
OPEN weekdays: 8:30 a.m. to 7:30 p.m.
Saturday: 9:00 a.m. to 2:00 p.m.
(706) 860-7364 • FAX (706) 860-7368


BULLDOG
 COMPUTER PRODUCTS[illegible]

H O R I Z O N S

AST PowerExec SL 3.25 63 120 HD	1499 1799
AST PowerExec SL 4 85 83 203 HD	CALL
COMPAQ Contura 3.25 84 120 HD	1499 1496
COMPAQ Contura 3.25C 84 120 HD	2049 2219
COMPAQ Contura 4 25 120 209 HD	2039 2299
COMPAQ Contura 4 25C 120 209 HD	2749 3049
COMPAQ Contura 4 25CX 120 209	3385 3687
COMPAQ CT TE Lite 256 84 120 HD	2899 3099
COMPAQ CT Lite 4 25C 120 209 HD	3995 4289
IBM Thinkpad 300 SL 80 120 HD	2335 2542
IBM Thinkpad 300 SL 80 120 HD	2599 2749
TI Wk S. C 25 60 80 HD	1719 1929
TI T4400 Wk SX 25 120 HD	2349
TI T4400 Wk DX 25 120 200 HD	2829 3089
TI T4400 Wk DX 50 200 HD	3899
TI T4400 Wk L DX2C 40 200 HD	3889
TOSHIBA 4500 4500C 120 HD	2495 2799
TOSHIBA 6400 2400 HD Gas Color	4149 6299

AST Bravo 486 33 120 HD	1499
AST Bravo 486DX2 50 120 HD	2099
COMPAQ Prolinea 3 256s 40 84 HD	729 829
COMPAQ Prolinea CD 256 40 Rom Sound	CALL
COMPAQ Deshpere 486s 256 120 HD	1429 1519
COMPAQ Deshpere 486 256M 120 HD	1979
COMPAQ Deshpere 386 256M 120 HD	1984
IBM PS 2 Mod 70 160 HD	1349
IBM PS 2 Mod 95 400 HD	5710
IBM PS 2 Mod 71 DX 200 400 HD	3626 4315
IBM Valuepoint 4258S 80 170 HD	1230 1435
IBM Valuepoint 433DX 120 212 HD	1595 1785

ATI 2400 ETC IntExt	69.95
BOGA 14.4 w/FAX IntExt	319.275
CARDINAL 2400 IntExt Port	497.98
HAYES Optima 14.4 w/FAX Ext	389
HAYES ultra 9600 14.4 w/FAX Ext	569.339
Intel SatsFAXton 100 200 400	101 299.389
MULTI TECH MT9232BA Int	479
PRAC PER PHERALS Pocket 14.4 w/FAX	359
PRAC PER PHERALS 14.4 Int Ext	364.396
US ROBOTICS CS Wordport 24.96 w/FAX Port	219
US ROBOTICS Sportster 96 nT Ext	169.189
US ROBOTICS Sportster 14.4 Int Ext	189.209

ATI Basic 16 VGA	59
ATI Graphic Ultra Plus 1MB/2MB	295.332
ATI Graphic Ultra Pro 1MB/2MB	425.519
BOCA SuperVGA 512K 1MB	89.119
CARDINAL VGA 110x 700A	55.129
DIAMOND Stealth 24 Pro 2MB	159.359
DIAMOND viper VLB	439
NUMBER 9 GXE Level 10.11 12	395.549.699
NUMBER 9 GX: TC Leve 29	1485
VIDEO 7 VGA 16 Win VGA 1MB	81.140

CREATIVE JABS Soundblaster 16	229
CREATIVE JABS Soundblaster Deluxe	399
CREATIVE JABS CD Rom Kit Int	84
CREATIVE JABS Discovery CD 8.16 Bit	CALL
MEDIAVISION Pro Audio Spectrum 16	189
MEDIAVISION Fusion CD 16 Int Ext	495.545
MEDIAVISION Pro 16 Multimedia System	949
NEC CDR 74-184-1 CD Rom	579.629
SONY CDU31A CD Rom w/Controller	299
SONY CDU31ALL CD Rom Multimedia Kit	619
TOSHIBA XMM3401 Int Ext	529/599



- Internal Tray-Loading CD Rom
- MPC X.A & Photo CD Compliant
- Includes 3 Great CD's
Grovers Encyclopedia
Great Wonders of the
World and Geoworks
CD Mar

\$365

AOC SVGA 14" Interlaced/NI	285/319
EMC MONO P/W	88
COMPAQ VGA Color	355
IBM 6312 6314/6319	395/505
IBM 6319	630
MAG MX15F MX17F	599/1089
MAG NOVOX CM 9039/9089	259/319
MTS/JBISH Diamond Pro 14" 17"	459/1089
MTS/UB SH Diamond Scan 14"/20"	399/1849
NANA0 5501 T5601	1119/1749
NEC 3FG 4FG	659/759
NEC 5FGE 5FG	1199/1299
SANITRON 14" VGA/SVGA	208/291
SEIKO CM1450 1760	425/1045
SONY CPD1430 1604S	599/1019
VIEWSONIC C V6 VGA 14"	240
VIEWSONIC V7 VGA 17"	1035

AMERICAN POWER	
Back UPS 250/400/600	99/162/260
Smart UPS 400/600/900	305/395/553
TRIPPLITE	
BC 250 400 500	98/154/177
BC LAN 500 600 1250	188/252/482
Omni 450 600/900	268/349/489

CONNOR				WESTERN DIGITAL			
CP30084	IDE	80MB	169	280	IDE	85MB	199
CP30104	IDE	120MB	215	2250	IDE	250MB	309
CP30174	IDE	170MB	235	2340	IDE	340MB	439

Western Digital			Western Digital				
WD3000BB	IDE	80MB	169	280	IDE	85MB	199
WD300104	IDE	120MB	215	2250	IDE	256MB	309
WD300174	IDE	170MB	235	2340	IDE	340MB	439

CP30254	IDE	250MB	319	ELS12*A	IDE	120MB	275
CP3544	IDE	540MB	915	ELS127S	SCSI	120MB	299
CP3540	SCSI	540MB	955	LPS240A	IDE	240MB	355
CP31370	SCSI	1.37G1890		LP52140S	SCSI	240MB	395
SEAGATE				LPS225S	SCSI	525MB	915

ST251-1	MFM	40MB	199	Adaptec 1522 v.Floppy	119
ST3144A	IDE	130MB	205	Adaptec 1542 Busmaster	29
ST3283A	IDE	248MB	350	Adaptec 1542 K.T.	156
ST1400A	IDE	340MB	689	Adaptec 1640 MCA	266
ST1480N	SCSI	426MB	839	Adaptec 1740 EISA	286
ST4766N	SCSI	660MB	1039	Ultrastor 1414 Busmaster	329
ST41200	SCSI	1 GB	1199	Ultrastor 24F EISA	499
MAXTOR				Ultrastor 34F	219

7120S	SCSI	130MB	239		w/2 Floppy	119
7213A	IDE	210MB	305	Future Domain	1670 16-Bit	
7345A	IDE	340MB	479		w/2 Floppy	139
535A	IDE	535MB	869	Future Domain	1680 16-Bit	
535S	SCSI	535MB	959		w/4 Floppy	269

1684	SCSI	340MB	1029	Busmaster	429
2105A	IDE	528MB	1089	IDE CONTROLLERS	
2105	SCSI	560MB	1089	16 Bit Controller Cable Kit	39
1624	SCSI	660MB	1129	Seagate ST08 w/2Floppy	49
2112A	IDE	1.0G	1245	32-Bit 512K Cache Controller	349

**ALL DRIVES ARE NEW
AND IN-STOCK**

ASK ABOUT OUR "PLUG-N-PLAY" PROGRAM

Dedicated Tech Support (708) 949-9371

Guaranteed Lowest Prices!!!

MS DOS 6.0 Upgrade	4
ALDUS Pagemaker 4.0	48
INCLUDES FREE UPGRADE TO 5.0	
ATECH Presentation Task Force	11
CALERA Wordscan Plus	36
LOTUS 1 2 3 v2.4 3.4	320/39
MICROSOFT Excel v4.0	29
MICROSOFT Office for Windows	48
SYMANTEC PC Anywhere v4.5	11
SYMANTEC Norton Desktop v2.0	11
WORDPERFECT v 5.1 5.2	262/26
CALL TODAY - 1000'S MORE TITLES AVAILABLE	

NOVELL Netware v2 5-10 User	486-109
NOVELL Netware v3.11 5-10 User	589-134
NOVELL Netware v3.12 20-100 User	1885-365
NOVELL Netware v4.0 SFT III	NE
CALL US FOR YOUR NETWARE UPGRADES	
ARTISOFT AE2 AE3 Starter Kit	469-53
ARTISOFT AE2 AE3 Cards	199-21
INTEL EtherExpress 16 16TP	129-13
SMC Ethercard + Elite 16-16TP	129-13
SMC Arcnet PC 600 FSWs	199-11
3COM Etherlink I I Coax/TP	139-13
THOMAS CONRAD TC6242 TC6245	69-18
XIRCOM Pocket LAN Adapters	CA

HEWLETT PACKARD	
LaserJet 4	1395
LaserJet 4M	1925
LaserJet 2P 3P	805 895
LaserJet 4S	CALL
KaserJet 4S MX	CALL
DeskJet 500	389
DeskJet 550	509
DeskJet 550C	699
DeskJet Portable	389
PaintJet XL XL300	1699 2259
ScanJet 2P 2C	839 1429
Fax 200 310	989 1292

BJ100 X B2U	249.359
BJ200 300/330	339.339.529
BJ800-820	1599.1749
IBM	
Laser 5E/6/6P	949.1279.1455
Laser 10/10P	1349.1865
4070 inkjet w Asf	385
2390/2391	335.459
4079 ColorJet w/Postscript	2679
NEC	
SilentWriter M95.95FX	1299.1849
SilentWriter M97.97FX	1689.2169
OKIDATA	
ML 320/321	313.432
ML 590, 591+	439.599
Okulaser 400.810.830	619.959.1313
PANASONIC	
KXP.1180.1213.1214	169.239.328
KXP.1124.1624.2604	2719.345.389
KXP.4416.4430.4450	649.924.1109

COLORADO DJ10/DJ20	149.21
COLORADO JT10/JT20	349.41
LOGITECH Mouseman Cordless	69.88
MICROSOFT Serial Ballpoint	85.12
IDENTITY 3 Button w/Pad Pocket Software	2

Custom Configurations Available to Fit **YOUR** Needs

GH386 SX/33	105/120/210	GH486 DX/33	130/170/210
GH486 SX/25	130/170/240	GH486 DX/50	170/210/340

- 486DX
- 33 MHz Processor
- 4 Megabytes of High Speed RAM
- 210 Mb IDE Hard Disk
- 1 2 Mb S 25 Drive
- 1 44 Mb 3 5 Drive
- **14" Non-Interlaced VGA Monitor**
- Mini Tower Chassis
- Two Serial Ports
- Parallel Port
- Game Port
- Clock
- Calendar
- MS-DOS 5.0
- Microsoft Windows 3.1
- Mouse



\$1599

151 E. High Street • P.O. Box 644 • Mundelein, IL 60060

HOURS CST: 7:00 a.m. - 6:00 p.m. - Monday-Friday • 9:00 a.m. - 1:00 p.m. - Saturday

STOCK INVENTORY - WE HAVE WHAT YOU WANT!! Most orders ship within 24 hours. We accept VISA, MasterCard, Discover and C.O.D.'s. Terms available - Immediate credit approval. Credit cards not charged until products ship. All warranties good through Global Horizons, Inc. Prices and availability subject to change without notice.

CALL TODAY FOR OUR SPRING CATALOG GALAXY OF VALUES!

FAXBACK SERVICE

(708) 949-9372

Send your Fax Today

All Quotes Answered in 24 Hours



85.125
are 25

International Orders Welcome



1-800-860-GLOBE



Interpreters Available

 Outside Illinois 1-800-860-4562
Inside Illinois (708) 949-9332
Shipping & Technical Assistance (708) 949-9369

HIGH PERFORMANCE PRINTER SHARING

Perfect for Windows!

For *much faster* Windows printing, disable Print Manager and let the HWP buffer your printing. Results are guaranteed to make you smile! And to pay for itself in time savings over and over again.

Easy Installation

Standard parallel connections make installation simple. The HWP configures as either 3 inputs to 2 outputs, or 4 inputs to 1 output. Printer selection is easy with either software commands or push-button control.

Best Performance Available

The HWP transfers data at speeds up to **180,000 characters per second!** It buffers large jobs from your PC faster than your printer can print them. You may proceed to your next task, whether or not printing is complete. And, unlike other buffers, it's guaranteed to print **every kind of job, every time.**

Large Buffer Capacity

Buffer is expandable **up to 16MB** to handle the largest graphics projects, a **great solution for CAD users!**



HWP 256K \$349
HWP 4MB \$495

CIRCLE 328 ON READER SERVICE CARD

Toll-Free Technical Support

Buffalo Technical Support provides friendly, effective assistance for installation and operation.

Toll-Free Application Advice

Our knowledgeable staff will help you select the right products for your needs. Buffalo carries a complete line of resource sharing products. **Just call!**

Five Year Warranty

45 Day Money-Back Guarantee

BUFFALO

**US and Canada Toll-Free
1-800-345-2356**

Buffalo Products, Inc.

2805 19th St. SE

Salem, OR 97302

(503) 585-3414

FAX (503) 585-4505

Response Code: 63HW1

BUFFALO is a registered trademark of Melco, Inc. All other brands and product names are trademarks or registered trademarks of their respective owners.



DON'T GIVE MONEY TO STRANGERS.

Before you give to a heart organization, make sure it's one you trust: The American Heart Association. Since 1924 we've sponsored lifesaving education programs and funded \$900 million in research. Others may copy us, but they can't hold a candle to our heart and torch. To learn more, contact the American Heart Association, 7320 Greenville Ave., Box 20, Dallas, TX 75231.

You can help prevent heart disease. We can tell you how.

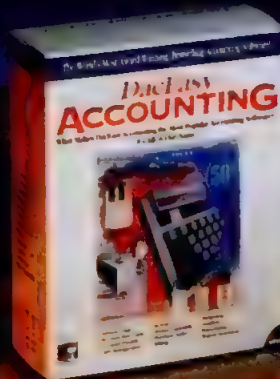
 **American Heart Association**

This space provided as a public service.

LOOKING FOR ACCOUNTING SOFTWARE? DACEASY IS ALL YOU NEED TO KNOW.

PC
MAGAZINE

1985
PRODUCT
OF THE
YEAR



PC
MAGAZINE

Product
of the
Year
1987

The Most Award-Winning, Best-Selling Accounting Software in the World.

Winning award, after award isn't easy, but DacEasy Accounting continues to be a winner in the eyes of experts and customers alike. In fact, **DacEasy has won more awards than all the other accounting software combined.** The readers of *PC World* chose DacEasy as the best accounting system on the market for 1992 and 6 out of the last 7 years. That's because it offers so much for such a low price. **Over 1.3 million businesses agree.**

DacEasy is the best-selling accounting system in the world. Why?

Because it's designed to meet the accounting needs of every business, large or small. Because it's simple to learn and easy-to-use on a daily basis. Because it includes 12 powerful modules. Because it's only \$149.95.

But it doesn't stop with DacEasy Accounting. Our new add-on modules are breaking sales records, too. DacEasy Payroll 4.3 at just \$99.95 is **the world's best-selling Payroll system.** Used by itself or integrated with DacEasy Accounting, it makes doing payroll quick and simple.

And new **DacEasy Point of Sale** is the **best-selling software of its kind on the shelf!** It's the easiest-to-use Point of Sale system available and it automates the sales process in seconds - all for only \$149.95.

Even our **new DacEasy Order Entry** system breaks all the norms when it comes to speeding up the order-taking process. It puts control back into the hands of the salesperson for just \$199.95.

You can look at other accounting systems that are overpriced or even those that claim to be easy and inexpensive, but why bother when you can use the best. DacEasy is simply the most popular choice for business accounting at any price. Try our new single-user or network systems of Version 4.3 totally **risk-free with our new 60 day money-back guarantee.** Sure, winning awards is nice - but with DacEasy, the real winner is you and your business.

DacEasy® Accounting™. The World's First Choice in Accounting Software!



Best-Selling Payroll, Point of Sale and New Order Entry!

CIRCLE 068 ON READER SERVICE CARD

DacEasy

See Your Local Dealer

1-800-DACEASY

In Canada Call: 1-800-563-3314

All products are registered trademarks of DacEasy, Inc.

77950 Preston Road, Suite 800, Dallas, TX 75242 © Copyright, 1993 all rights reserved.

MEDIA CODE: PCM

When PCs Come Whole New Com They Could

PCs COMPLEAT

Direct marketers offer convenience, low prices, customer service and technical support—for their own brands of PCs and laptops. Retailers offer a choice of leading brand names.

What if you combined the best of both worlds?

That's what Gordon Hoffstein and his partners had in mind when they founded PCs Compleat in January 1992.

"We wanted to give buyers a place where they could choose from a broad selection of leading national brands and still get all the advantages of buying from a first-rate direct marketer.

"For example, when a buyer calls us about laptops, we can offer him thirty different choices. And he can discuss the standard and optional

Gordon Hoffstein,
co-founder, PCs Compleat

Compleat Introduced a New Concept in Retailing, You Can't Afford to Start Small

features offered by each manufacturer with a technically sophisticated salesperson who has all the facts. We do custom configurations and load applications software. We'll install DOS or Windows, perform a complete system test, and ship the product out the same day it's ordered. And we provide toll-free lifetime technical support."

Hoffstein considers PCs Compleat a breakthrough concept in computer retailing. "When you have an idea this good, you don't want to be shy about it. That's why one of my first marketing decisions was to put a spread ad in every issue of PC Magazine, using the PC Direct section. And it's turned out to be our best lead generator by far."

The PC Magazine reader is Hoffstein's ideal customer.

"Not only does PC Magazine bring us a lot of customers, it brings us the kind of customers we want, those who know that value means more than just a low price.

"Because PC Magazine readers are knowledgeable about the products and features they want, they know what questions to ask our salespeople and they're ready to buy on the first call. They're also more interested in adding options like memory upgrades and fully-loaded software. And they can communicate with our technical support people in an efficient way."

If you're a direct marketer with a breakthrough idea, bring it to the attention of 900,000 of the most active and knowledgeable PC buyers. Call your PC Magazine sales representative or 212-503-5100 and get the facts about PC Direct.



The Purchasing
Source for
Direct Buyers

See the Disk Spin.

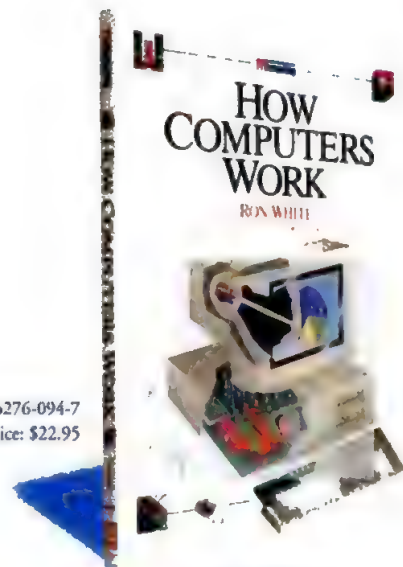


CD-ROM
Drive

See the Mouse Point. See How Computers Work.

Discover what really makes your PC tick in this exciting new book, *PC/Computing How Computers Work*. This skillfully illustrated, completely original guide graphically dismantles the PC and shows in brilliant full-color detail what really happens when you boot up the computer, input text from the keyboard, click the mouse, store data on the disk, send output to the printer, and more. Written by *PC/Computing* executive editor Ron White and based on the magazine's popular "How It Works" column, *PC/Computing How Computers Work* is the perfect companion for the computer enthusiast!

ISBN: 1-56276-094-7
Price: \$22.95



PC/Computing
How Computers Work
by Ron White



© 1992 Ziff-Davis Press

Ziff-Davis Press books are available at

CROWN BOOKS

CIRCLE 113 ON READER SERVICE CARD

Premier

The color showcase that puts the spotlight on leading-edge PC products and services.

429-441

Windows

An every-issue four color section featuring quality products for the Windows environment.

442

Classified

Flexible-format display advertising: computer systems, components, software and more.

443-451

BusinessCard

A forum for innovative, hard-to-find and low cost PC hardware, software and services.

452-458

HARDWARE

Boards/Components/Chips
Communications
Computer Systems
Input/Output Devices
—Barcoding
Mass Storage Devices
Midi
Multi-Media
Networking
OS2
Security
Video

Premier Classified

430 443
431
432 443
433 444
444
435

445

SOFTWARE

Business Applications
Communications
Education
Financial
Graphics/Design
Multi-Media
—Midi-Music
Personal
Public Domain
Scientific
Security
Shareware

Premier Classified

437 446
438 446
446

447
438 447

439

440 447
448

Systems/Languages
Utilities
Vertical Applications
Adult
Windows

Premier Classified

440
441 450

SUPPORTING PRODUCTS

Information Resources
Services
—Data Conversion
—Data Recovery
—Software Duplication
Supplies

441
448
448
448
449

KONEXX

Connect Your Modem To
PBX and Digital Telephones.



THE KONEXX KONNECTOR • MODEL 112

Connect your modem into the RJ21X jack of any PBX, rotary, digital, or digital line. The Konnect Model 112 works at all baud rates and connects from the standard AC adapter or optional battery, making it ideal for field installation. Plus, automatic hook-flash switching lets you dial with central management and scheduling software. Don't need a dedicated phone line, install the KONEXX Konconnector.

\$149
PLUS SHIPPING

KONEXX products work with all FAX Modems and FAX Buses

THE KONEXX KOUPLER • MODEL 203

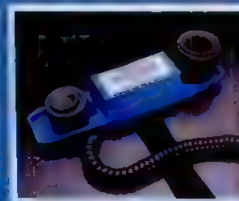
The KONEXX Koupler was designed with the traveling communicator in mind. Acoustically couple your modem to any telephone, including public pay phones, cellular phones, and business telephones, and transmit data at speeds up to 9600 baud.

\$140 PLUS SHIPPING

THE KONEXX KIT

Included are all the necessary connection tools for efficient connection and communication over all types of telephones. The KONEXX Kit contains: the KONEXX Koupler Model 203 high speed acoustic coupler, a combination screwdriver, duplex adapter, alligator clip adapter, Merlin phone adapter, spare 9-volt battery, 7 ft. modem cable and custom carrying case.

\$169 PLUS SHIPPING



CALL

1-800-275-6354

for more information or local dealer



**UNLIMITED
SYSTEMS**

UNLIMITED SYSTEMS CORPORATION INC.
8586 Miramar Place • San Diego, CA 92121
Phone 619-522-1400 • Fax 619-550-7330

CIRCLE 851 ON READER SERVICE CARD

Come See Us At
Spring COMDEX
Booth # 2627

PC⁴ Mac 800-392-5840

Whether you are looking for a simple IDE drive or a complex SCSI chain, our sales staff are experts in recommending complete solutions for DOS, OS 2, Novell or UNIX environments. All of the drives you see listed, except where noted, are quoted as an internal drive; however, we can enclose any of our half height SCSI peripherals for \$85.00, and any of our full height peripherals for \$149.00.

TOSHIBA XM-3401

The fastest CD-ROM drive in the industry and we have them in stock. This drive has a 200ms access time with a 330Kb per second data transfer rate and 256K cache. One of the SHAFUS with laser technology is dust. Toshiba has eliminated this problem by completely sealing the drive components. It's Multi-Session Kodak Photo-CD, MPC, and XA compatible. Our kits include one XM-3401, 1 SCSI compatible Host Adapter with SCSI software, Toshiba CD-ROM driver software, one CD caddy, one user's manual and all the necessary cabling.

Internal: Price kit, \$249.95 external kit \$324.95

*Includes our IBM drive housing.

Macintosh CD-ROM Driver Software \$39

NOW IN STOCK FROM SYQUEST TECHNOLOGY

The first IDE removable cartridge drive! This is Syquest's most versatile drive to date. It is a 3.5" one inch high internal IDE, with a 105mb formatted capacity. With a 14.5ms access time, it will keep up with any traditional hard drive in its capacity. It can be used on your standard IDE controller as either a slave, master or boot drive.

Internal: Price kit, \$499.00
Each 105mb drive cartridge \$79.00

RUNNING OUT OF DISK SPACE?

Is your disk drive big enough to support your software needs? Constantly running out of disk space? There was a time when all you could do was delete files - or buy a costly new hard drive. Not today! The solution! XTRA DRIVE Software will instantly double your disk capacity - just as though you have added another drive to your system. How? XTRA DRIVE will transparently compress all the files on your hard disk. You will be able to fit about twice as much data on the same hard disk as before. \$39.99

\$39.99 with purchase of drive



Quantum 3.5" Drives

Size	Model	Speed	Price
40mb	ELS42	19ms	\$169
85mb	ELS85	17ms	\$189
127mb	ELS127	17ms	\$259
170mb	ELS170	17ms	\$299
240mb	LPS240	16ms	\$379
525mb	Pro525	10ms	\$869
700mb	Pro700	10ms	\$1199
1050mb	Pro1050	10ms	\$1349
1225mb	Pro1225	10ms	\$1499

Seagate

1.2gb	41200N	15ms	\$1479
1.6gb	41650N	15ms	\$1729
2.1gb	42100N	12.9ms	\$1959
1.6gb	*41600N	11.5ms	\$1949
2.4gb	*42400N	11ms	\$2749
3.4gb	*43400N	11ms	\$3699

*Denotes Elite Drive.
IDE in stock.....Please Call

Maxtor 3.5" and 5.25" Drives

120mb	7120S	15ms	\$229
213mb	7213S	13ms	\$335
340mb	LXT340S	13ms	\$599
1.2gb	Panther	13ms	\$1389
1.7gb	Panther	13ms	\$1550
120mb	7120A	15ms	\$229
170mb	7170A	15ms	\$269
213mb	7213A	13ms	\$329
245mb	7245A	15ms	\$349

Fujitsu 3.5" and 5.25" Drives

520mb	M2624S	12ms	\$839
1080mb	M2691S	10ms	\$1529
1.2gb	M2266S	14ms	\$1329
2.0gb	M2652S	11ms	\$2229
2.4gb	M2654S	11ms	\$2489

Conner 3.5" Drives

80mb	CP30084	17ms	\$189
120mb	CP30104	17ms	\$239
170mb	CP30174	17ms	\$269
200mb	CP30204	12ms	\$339
510mb	CP3504	12ms	\$779
540mb	CP3544	12ms	\$859

Toshiba 3.5" Drives

877mb	MK438FB12.5ms	\$1065
1.05gb	MKS38FB12.5ms	\$1369

Mikropolis

1050mb	2112A	10ms	\$1329
--------	-------	------	--------

Add \$99 for External.

Adaptec

16 bit	1522	3mb/sec.	\$99
16 bit	1542C	5mb/sec.	\$225
1640	Microchannel		\$269
32 bit	1742 A	10mb/sec	\$425

The above pricing includes one 3-head SCSI ribbon cable, Adaptec EZ SCSI software, and ASPI Manager, along with all accompanying documentation and installation manuals.

Tape Software

We stock Sytos and Central Point Backup for Windows and DOS, Retrospect and SurfGuard for Macintosh, Cheyenne Arcserve 4.0, and Legato Networker for Network.

IDE Controller Kits

16 bit		\$29.50
--------	--	---------

Pricing includes controller, 2HD, 2FD, IDE cable, mounting bracket and rails.

5761 E. LA PALMA AVENUE, STE. 289 • ANAHEIM, CA 92807

Archive Viper 2525S 525MB

Buy into the company that pioneered 1/4" tape products. Archive's 50% marketshare demonstrates its strong influence in 1/4" cartridge drives. The Viper has a 525mb capacity and backs up 14mb per minute on a standard SCSI bus.

Internal 8-bit kit	\$559
External 8-bit kit	\$643

Archive Turbo DAT 8 gb - 88 mb per minute!

Get the compatibility of the standard Python in a drive that leaves the competition in the dust. Archive designed the Turbo Python's enhanced compression and transfer rates to be transparent to the user and your software, so if you see the regular Python supported, you're guaranteed that the Turbo will be as well.

Internal 8-bit kit	\$1329
External 8-bit kit	\$1414

Internal kit includes drive, 8-bit SCSI controller, ASPI software, ribbon cable, tape cartridge and user's manual. External same as above, with Pro HH case, external SCSI cable and terminator.

Archive Python Dat 2 gb

This is the most compatible and highly supported DAT drive on the Market. It supports SCSI 1 and SCSI 2 interfaces and has a transfer rate of up to 11mb per minute.

Internal 8-bit kit	\$999
External 8-bit kit	\$1084

PC⁴ Mac

PRINTER SHARING & MEMORY

800-238-9415

I/O = input/output

□ = serial

■ = parallel



LCX-1000 (1Mb) \$495
8 ports, 4 serial I/O, 57,600 bps
2 parallel in, 2 parallel out

LC-256 (256Kb) \$375

LC-512 (512Kb) \$425

8 ports, 4 serial I/O, 19,200 bps
2 parallel in, 2 parallel out

LXFR-ETC \$49

Windows & OS/2 File Transfer
4 user license, for LC or LCX

PB-42PP-256Kb \$199

PB-42PP-1Mb \$249

6 parallel ports, 4 in / 2 out
Upgradable to 4Mb, 25,000 cps

LC-41PAS \$69

5 parallel ports, 4 in / 1 out
Smart-switch, 25,000 cps

LC Jr.-256 (256Kb) \$199

LC Jr.-512 (512Kb) \$249

5 ports, 4 serial in, 1 parallel out
Up to 115,200 bps

SPPS \$49

9600 bps to 115,200 bps
Serial / Parallel Converter

PB-11PP-1Mb \$199

2 parallel ports, 1 in / 1 out
Upgradable to 16Mb, 75,000 cps



PCMCIA 2.0 SRAM Cards:

512Kb - \$120 1Mb - \$175 2Mb - \$295

Toshiba:

1000XE SE, LE, 1800 1850

2000, 2000SX, SXE, 2200SX

2Mb - \$90 4Mb - \$150 8Mb - \$275

3300SL

4Mb - \$150 6Mb - \$225

4400SX

4Mb - \$150 8Mb - \$275

Powerbook & MAC:

100/140/145 170 160 165 180

6Mb - \$250 8Mb - \$310 10Mb - \$390

DUO 210 230

6Mb - \$260 8Mb - \$320 10Mb - \$410

Cent 610-650, Quad 800, LCIII

4MB - \$145 8Mb - \$260

MAC SIMMs (70ns.):

1x8 - \$32 4x8 - \$124 16Mb - \$495

LOGICAL CONNECTION 4660 Portland Road NE #108 Salem, OR 97305-1658 Tech.: (503) 390-9375 FAX: (503) 390-9372

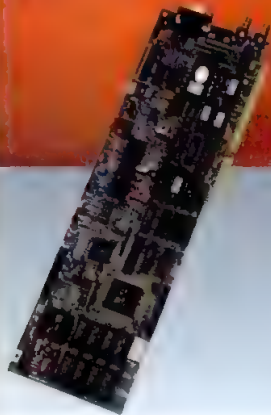
CIRCLE 854 ON READER SERVICE CARD

RocGen

Output your Multimedia Productions to VHS

3 in 1 Multi-output card for PC

Soon compatible
in color VHS systems



- Hi Color VGA Controller
- Scan Converter (VGA to TV conversion)
- Genlock board with dissolve control
- Special effects: Dissolve, Fade-in, Fade-out, Tinting, Inverted (Keyhole effects)
- Overscan
- Optional external fader box with S-Video I/O connector
- Chroma key add-on
- Built-in feature port
- Built-in expansion port
- Output NTSC video for display on TV or record to VCR

Call us for more information:
408-379-1713

ROCTEC ELECTRONICS INC.
170 KNOWLES DRIVE, SUITE 202
LOS GATOS CA 95030, U.S.A.
FAX: (408) 379-1897



Genlock for Amiga also available

CIRCLE 855 ON READER SERVICE CARD

\$399
RETAIL

ROM BIOS UPGRADES

LARGEST BIOS DISTRIBUTOR!!!
AMI-MR. BIOS-PHOENIX
STARTING AS LOW AS \$29.95

ROM BIOS SOME FEATURES INCLUDE: SET-UP IN ROM
FULL SUPPORT FOR WINDOWS, IDE, SCSI,
UP TO 2.88MB FLOPPY, VIRUS & PASSWORD PROTECTION,
47 DRIVE TYPE INCL. 2 USER DEFINABLE, VGA, AUTO DETECTION
ENHANCED KEYBOARD ETC.. WE WILL SOLVE INCOMPATIBILITY PROBLEMS!!
MEMORY LASER MEMORY: HP IV 4MB \$150.00, HP III 2MB \$98.00
PANASONIC 4410/30 2MB \$108.00 PANASONIC 4410/30 4MB
\$155.00 HP-PANASONIC-IBM-NEC-APPLE-AND MORE! SIMM-SIPP-DRAM
MEMORY AVAILABLE FOR ALL PC'S & LAPTOPS! CALL US NOW!!
TTI MOTHERBOARDS & SYSTEMS UPGRADEABLE 386'S, 2 YR. WARRANTY
286-386-486 SYSTEMS CUSTOMIZED,
VESA LB MB'S START AT \$85.00, VL BUS & VIDEO CARDS, ALPHA RESEARCH MB'S!

TTI TECHNOLOGIES
2432-A PALMA DRIVE
VENTURA, CA. 93003 805-650-2030 FAX 805-650-6515

800-541-1943

VISA, MC, DISC, AMEX, COD

CIRCLE 858 ON READER SERVICE CARD

ROM BIOS UPGRADES

- Support Windows 3.0/3.1 • Support 1.2 MB & 144MB Floppy Drives • User defined hard drive types • Support VGA • Novell & Netware compatible • Enhanced 101 102 keyboard
- 100% IBM compatible • Complete documentation • DOS 5.0 • Latest Version • Complete set up in ROM • Free Intel Chip Puller

We are the oldest and
largest BIOS upgrader in the
world. Guaranteed lowest
prices all the time.

- IBM • AST • Wyse
- Acer • AMI • Kaypro
- Leading Edge • Micronics • Compaq
- DTK • Hyundai • Everex
- Dell • Sanyo • Gateway
- Sperry • Samsung • Tandy
- Northgate • Wells American • Epson

ORDER TODAY ☐
1-800-800-2467
MA, FL, CA OFFICES

UNICORE

1888 Tumble St. • North Andover, MA 01845
(508) 686-6468 • FAX (508) 683-1630

CIRCLE 859 ON READER SERVICE CARD

Multi-Line Voice Mail Plus...

**FAX ON
DEMAND!**

**FAX ON DEMAND • VOICE MAIL
CALL PROCESSING • TELEMARKETING**

V/S PLUS gives you professional VOICE MAIL & AUTO TRANSFER while it pounds out Fax'd Hard Copy non-stop 24-hours a day. Give it to them - NOW! Complete Package with Hardware and FAX Software. 2 year warranty Requires PC/AT/386/486

V/S PLUS only \$699 For Sales and Information Call
MULTI-LINE HARDWARE from \$299 1-800-934-8084
510.522.3800 • FAX 510.522.5556

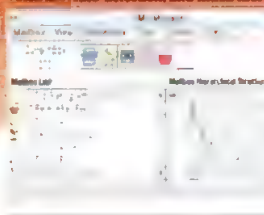
Developer/DEM package, special
VISA/MC/AMEX/OD TALKING TECHNOLOGY, INC.
1177 ATLANTIC AVE., SUITE 100, WILMINGTON, DE 19801

CIRCLE 856 ON READER SERVICE CARD

New for Windows 3.1!

It's Voice Mail.
It's Fax-on-demand.
It's an Applications
Generator.
It's \$495 for board
and software.
It's **PhoneOffice**.

PhoneOffice applications include: answering
Machines 3.1.1, Configure for Auto-Attendant,
Message Center, Fax-on-demand, Message
Forwarding, Paging Scheduling, Fax-scanner,
Voice/Fax Auto-detection, and much more.



Call our demo line 309-862-1804
to get more information by fax-on-demand.
Tel: (309)862-1704 Fax: (309)862-1804
309 W. Beaufort, Suite 8, Normal, IL 61761

Dealers, call us about our specially discounted promotional units.

CIRCLE 857 ON READER SERVICE CARD

LET YOUR COMPUTER DO THE TALKING!

Integrated Voice/Fax Mail

integrates major voice/fax applications plus
program control into one full-featured high
performance software. PC-AT/386/486 based.
Menu driven. Easy to use. Full support for
Rhetorex, New Voice, Dialogic, TTI and Intel
voice and fax hardware. Supports up to 24
voice lines and up to 8 fax lines.

Hardware + Software
4 voice lines package starts at **\$950**
Tel: (818) 368-6132 Fax: (818) 368-7859

SigmaTech Software

24 hours demo lines: 818-368-4566 or 818-368-8848
10801 Bismarck Ave., Northridge, CA 91326 USA
(Resellers/Dealers/OEMs/Private labels are welcome)

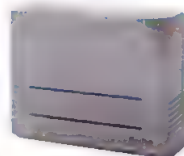
- Auto-Attendant
- Unlimited Audiotex
- Voice Mail
- Call Processing
- Telemarketing
- Fax Mail
- Fax-on-Demand
- Fax Broadcasting
- Party/Chat lines
- Talking Yellow pages

CIRCLE 860 ON READER SERVICE CARD

STOP COPYING FAXES! PLAIN PAPER FAX

From Your Laser Printer
with **FaxPak**

- No Computer Required
- Connects to Serial or Parallel Printer Port
- Connects to PC or Net Server to Share Printer
- Receives and Stores Faxes if Printer is Busy or Off
- Built-in Auto Switch to Share Phone Line with Telephone, Fax, and Answering Machine
- For HP, Canon and Compatible Laser Printers
- 2 Year Warranty. 30 Day Money Back Guarantee.



\$198
Introductory Offer

Teledisk Systems, Inc. **Orders: 1-800-669-3700**

2401 Marinship Way Sausalito, CA 94965

* Reg. \$299. Offer expires June 30 1993

CIRCLE 861 ON READER SERVICE CARD

HARDWARE/BOARDS/COMPONENTS/CHIPS-COMMUNICATIONS

PC-EXTENDER PLUS™



Extend the distance between your PC and a keyboard, VGA monitor and mouse up to 250 feet!

- Supports PC, PC/XT, PC/AT, PS/2 and 100% Compatibles
- Supports monochrome or color VGA monitors
- Offers conversion from RGB color to gray-scale
- PS/2 style or Microsoft/Logitech serial mouse support available

PC-COMPANION PLUS™



Add a second keyboard, monitor and mouse to your PC up to 250 feet away!

- Supports PC/AT, PS/2 and 100% Compatibles
- Combine monochrome and color VGA monitors
- Mouse support available at both local and remote workstation
- Switch selectable privacy mode

IBM, PC, PC/XT, PC/AT and PS/2 are registered trademarks of International Business Machines Corporation. Microsoft and Logitech are registered trademarks of their respective companies.



2800-H Bob Wallace Ave. • Huntsville, AL 35805 U.S.A.
(205) 534-0011 • FAX (205) 534-0010
 Dealer Program Available Made in USA

CIRCLE 862 ON READER SERVICE CARD

Local Bus Solution

32 Bit Local Bus!

**486DX
33MHz**

Intel 486DX 33MHz
 4MB RAM
 VL-Bus VGA Card
 VL-Bus IDE Controller
 170MB Hard Drive
 1.44 & 1.2 Teac Drive
 101 Enhanced Keyboard
 High Res Serial Mouse
 15" SVGA Monitor
 1 Year On-Site Service
 MS Windows & DOS

\$1795

**486SX 33MHz
\$1695**

**486DX/2
66MHz**

Intel 486DX/2 66MHz
 4MB RAM
 VL-Bus VGA Card
 VL-Bus IDE Controller
 170MB Hard Drive
 1.44 & 1.2 Teac Drive
 101 Enhanced Keyboard
 High Res Serial Mouse
 15" SVGA Monitor
 1 Year On-Site Service
 MS Windows & DOS

\$1995

**486DX/2 50MHz
\$1895**



"486SX/25 goes for high-powered, high-quality image—and succeeds."

PC Magazine

COMPUTERS, INC.®
Acmd

47988 Fremont Blvd., Fremont, CA 94538
 (510)623-1212 FAX (510)623-0818

800-786-6888

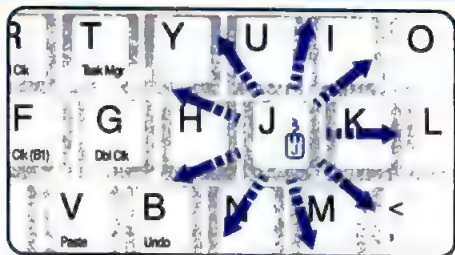
Ext. 81

All Prices & Specifications are subject to change without notice. Please call to confirm pricing, specifications and warranty details. All products and company names are trademarks or registered trademarks of their respective holders.

CIRCLE 863 ON READER SERVICE CARD

SEJIN J.M. KEYBOARD

with the Mouse under the "J" Key
(Invisible Mouse)



J.M. KEYBOARD lets you keep your hands on the keyboard and operate your mouse at the same time. You type, mouse around, return to typing, and your hands *never* leave the keyboard! No serial port, no extra cables, no mouse pad, means more desk space!

- Keyboard Selectable - 10-Speed Pointer Control
- 14 Mouse Buttons for Windows
- Lifetime Guarantee on Keycap Legends

DISTRIBUTOR INQUIRIES
INVITED

Available at
COMP/USA, DOMINO
and other fine computer stores.



SEJIN AMERICA, INC.

Santa Clara, CA • 800-283-4080 Ext. 840

Lowest price for comparable quality

CIRCLE 864 ON READER SERVICE CARD

Super Buy 486/386 VGA Portable

386 DX - 33 MHz

\$1399

40MB HARD DISK (UP TO 330MB)

2MB RAM (UP TO 32MB)

UPGRADE TO COLOR \$2999

3 FREE SLOTS PLUS \$45

1.2 OR 1.44MB FLOPPY

102 KEY KEYBOARD

SERIAL/PARALLEL PORTS

32 GRAY SCALE DISPLAY

2 YEAR LABOR 1 YEAR PART WARRANTY

NOTEBOOK OR EXTERNAL TAPE BACK

UP (USE PRINTER PORT) AVAILABLE

Tel: (714) 994-0805

Fax: (714) 994-0858



COMPUTOP INC

14634 Firestone Blvd

La Mirada, CA 90638

SINCE 1987



CIRCLE 865 ON READER SERVICE CARD

Money-Back Guarantee & 1 Yr. Warranty

**Popular
Space-Saver
Keyboard
\$98.00**



Saves 60% desk space. Footprint 27.3 x 15.2 cm. 100 full-travel tactily responsive keys. Standard left-right spacing for easy touch typing. IBM XT/AT PS 2 compatible. Many language versions available.

Call Toll Free To Order: 1-800-DATALUX

DATALUX

- VISA, MC, AmX -

"See us at Spring Comdex"

155 Aviation Dr. • Winchester, VA 22602

Tel 1-703-662-1500 • FAX 1-703-662-1682

Auto-FAXed Specs FAX 1-703-662-1675

CIRCLE 867 ON READER SERVICE CARD

Crammed into your laptop?

Up to 1.1 GB
for laptops

NOW
NOTEBOOK
212 MB!



Are you outgrowing your laptop or notebook's capacity? Tired of software "quick fixes"? Now you can get the storage you need to effectively operate today's data-intensive applications and operating systems.

Up to 180 MB for notebooks

LSI specializes in internal upgrades. We can replace the fac-

tory-original hard drives in Toshiba, Compaq, and other major manufacturers' laptops and notebooks with higher-speed, higher-capacity drives without adding bulk or weight. If you're feeling the applications squeeze, call us. You'd be surprised how much room there is in your laptop.



(800) 683-6839
Laptop Solutions, Inc.

10700 Richmond Ave., #114 Houston, Texas 77042

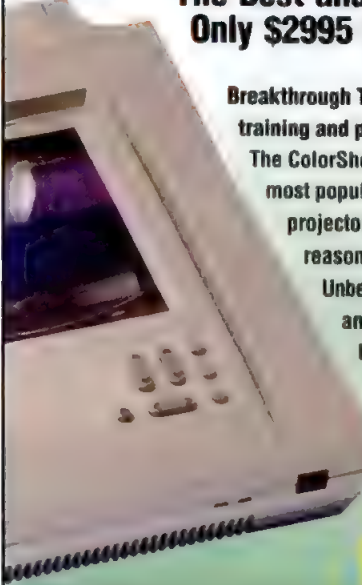
Local: (713) 789-0878 FAX: (713) 789-8177

All product names are trademarks or registered trademarks of their respective owners.

CIRCLE 868 ON READER SERVICE CARD

PC Screen to Big Screen!

**The Best and The Brightest!
Only \$2995 from BOXLIGHT!**



Breakthrough Technology for meetings, training and presentations.

The ColorShow is the industry's most popular color software projector for all the right

reasons: Brilliant true color!

Unbeatable reliability! Versatility and ease of use!

Price! Price! Price!

• 640 x 480 resolution

• IBM and Mac compatible

• 1-year warranty

• Same-day shipping

**Order today...
Use It Tomorrow!
Just Call...**

800-497-4008

**BOXLIGHT
CORPORATION**

America's Largest and most Experienced LCD Specialists

17771 Fjord Dr., N.E., Poulsbo, WA 98370 • 206/779-7901

Payment: Visa, MasterCard, American Express, COD and Purchase Orders (some restrictions)

Leasing and Rental Options Available, 30 Day Money-Back Guarantee

CIRCLE 869 ON READER SERVICE CARD

Shopping Hand Scanners? ENVISIONS' Bundle is MORE LOGICAL THAN LOGITECH[®] BY FAR!

When compared against eight other hand scanners, including the ScanMan Model 256, "The ENV256 is a bargain." —PC Computing 7/92



Features and Bundled Items:	ENVISIONS ENV256 [™]	Logitech ScanMan [®] 256
Resolution up to 400 dpi	✓	✓
256 Grayscale	✓	✓
Automerge/AutoStitch	✓	✓
Image Editing Software Included:	HALO Desktop Imager PC Magazine Editors' Choice	FotoTouch by Logitech
Text Scanning Software Included:	Recognita GO-CR	Catchword Pro by Logitech
Free Clip Art Library & ScanPad	✓	Available at additional cost
Your Price:	\$199.00	\$379.99*

*Price quoted by 3 Egghead Software stores in the San Francisco Bay Area on February 19, 1993.

Let's be reasonable. Both the ENV256 and ScanMan 256 are terrific scanners. Both come with premium software to scan text and graphics. Both scan full pages using automerge technology. Then why does Logitech make you pay so much more? We can't figure it out either! It's not logical!



- Recognita GO-CR**
 • Scan text for quick data entry without retyping
 Retail \$195
- Desktop Imager**
 • Automatically merges scans
 • Prints files for posters
 Retail \$139



Free ScanPad and Clip Art

ENVISIONS

Summer Solutions Made Easy



Call for our free scanner catalog:

1-800-934-7226

E.S.T. Inc. 822 Muller Road, Burlingame CA 94010 PH: 415-492-9061 FX: 415-492-9064



ONLY ONE THING COULD BE EASIER THAN OUR BAR CODE PRINTING SOFTWARE.

All StrandWare form and label generation software packages are easy to learn and easy to use. Like newly-upgraded Quick Draw, with mouse driven pull-down menus, and laser down-loadable bar codes for fast printing of Zip + 4 Postnet and most popular bar codes—all for just \$259. Or try other StrandWare bar code printing software products, including Label Matrix, Power Label and Bar Code Library. Call (800) 552-2331 or fax (715) 833-1995 to find out more.

The Computer Connection
StrandWare
 For Anyone Who's Keeping Track

© 1992 StrandWare, Inc.

CIRCLE 669 ON READER SERVICE CARD

ERGONOMIC NO MORE WRIST PADS!

European designer Luigi Colani has created the most comfortable mouse input device on the market. Available in Mac and PC versions. Dealers call for special display offer. Available exclusively through Moustek, Inc. 1-800-221-4622



\$79
 RETAIL

MOUSTEK
 2701 Conestoga Drive
 Carson City, Nevada 89404
 1-800-221-6681 or 702-484-1120

CIRCLE 670 ON READER SERVICE CARD

Call us for
Unsurpassed
Choices...

MULTI-PORT SERIAL I/O CONTROLLERS



Multiple Benefits:

- 2 to 128 serial ports on a single PC
- Standard or high performance communications
- Support for a broad spectrum of interfaces and operating systems
- Ideal for office automation, factory automation or P.O.S. applications
- Benefit from Star Gate's *total value*: a synergy of *Product-Price-Service-Support*
- *Compatibility*: ISA, EISA, MCA; RJ-12, DB-25, DB-9; RS-232, RS-422, RS-485; speeds up to 115.2 Kbaud; Unix, Xenix, DOS, OS/2 and Windows.

Call now: 1-800-782-7428



People and products
you can depend on.

Star Gate Technologies, Inc.
29300 Aurora Rd., Solon,
OH, 44139 • (216) 349-1860
FAX: 216-349-2056

CIRCLE 871 ON READER SERVICE CARD

NEW!!

600 x 600 dpi

LaserJet 4

FUNCTIONALITY

\$599.*

Manufacturer's suggested retail price
Ask for special introductory pricing

ORDER HOT LINE

1-800-446-9517

30-Day Satisfaction
Guarantee



Laser Printer Accessories Corp.

San Diego, CA 92127

☎ 619.485-8411 FAX 619-487-5809

LPAC has recently introduced a new product, **doubleRES4™**, that increases the resolution of a LaserJet Series II or Series III printer to a true 600 x 600 dpi.

Additionally, **doubleRES4** increases the print speed of Microsoft Windows™ by a factor of 25% to 45%.

Now, for a fraction of the cost of a new LaserJet 4 printer, you can get true 600 dpi printing for your Windows documents - using the LaserJet II or III you already own! And, you'll protect one of the best investments you ever made.

doubleRES4 plugs into the external I/O slot on the back panel of your LaserJet printer. It uses your existing parallel cable. And, you won't need to make any investment in additional memory.

Full support is provided for TrueType™ and ATM™ fonts.

Plus, if you share your LaserJet, **doubleRES4** will provide the same increased resolution and enhanced printing speed to everyone connected to the printer.

CALL TOLL-FREE, TODAY!

CIRCLE 873 ON READER SERVICE CARD

MiniSCSIplus

High-Performance Parallel-to-SCSI Adapter

Transform Your Parallel Port

Connect up to 7 SCSI devices to your parallel port and **still** use your printer!

Up to twice as fast as our original MiniSCSI, the MiniSCSI Plus lets you run a CD-ROM, tape backup, SyQuest, Bernoulli or other SCSI device from almost any parallel port. For most notebook users, it's the only way to use SCSI devices. Plus, an integrated cable makes it a snap to share SCSI devices with desktops and other notebooks.

Call Today For Details!

800-872-6867 • 800-TRANTOR



Trantor Systems, Ltd.
5415 Randall Place • Fremont, CA 94538-3151
TEL: (510) 770-1400 • FAX: (510) 770-9910

© 1993 Trantor Systems Ltd. MiniSCSI and MiniSCSI Plus are trademarks and Trantor is a registered trademark of Trantor Systems Ltd. All other product names are trademarks of their respective companies.

"This product is darned near perfect"
—Jerry Pournelle, Byte Magazine March 1993

"This year, the company outdid itself
The MiniSCSI Plus is even more elegant than its predecessor and almost twice as fast"
—Jim Seymour, PC Magazine December 1992

SCSI
Connector

Printer
Passthrough
Connector

Integrated
3' Cable

- 100% Printer Passthrough
- Weighs Just 7.2 Ounces
- Fully Compatible With Bidirectional and Unidirectional Parallel Printing
- Powered By The SCSI Bus
- Only \$229.00

Parallel
Connector

EPP Version Available!

CIRCLE 872 ON READER SERVICE CARD

HOW TO GET 256 Mb TO GO.



256Mb/128Mb Rewritable 3.5" Optical Drive

Great things come in small packages. With the Vista V256 you get:

- **Full Compatibility** - Read and write to ISO Standard 128 Mb cartridges and true, non-compressed 256Mb to GZ cartridges
- **Reliable** - acclaimed M.O.S.T. mechanism
- **Fast transfer** - up to 1.2Mb per second
- **Versatile** - Mac and IBM compatibility

All this for only **\$1,798**, including 1 cartridge. Get in to the computing world's favorite new storage technology.

Order Direct 1-800-944-6232

O.C.E.A.N

11205 Knott Avenue / Suite A
Cypress, California 90630
(714) 898-1340

CIRCLE 874 ON READER SERVICE CARD

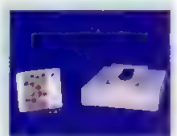
INPUT/OUTPUT DEVICES—MASS STORAGE DEVICES

"My Hotcakes Are Selling Like CD-Rom Drives!"



OUR CD-ROM DRIVES are sizzling and we have loads of them on hand! You'll flip when you find this drive incorporates the Super High-Speed SCSI-2 Toshiba XM-3401 drive mechanism with a

200ms access time and 330kb per second sustained transfer rate. It's MPC compliant and supports both CD-ROM XA and Multi-Session Kodak Photo CD. Call now and get 'em while they're hot!



VCP PARADIGM 3401 IN VCP PARADIGM HOUSING INCLUDES Mega Housing, A22 Write PS, Plug 50 Pin Connector, 25 Pin 50 Pin Cable (Macintosh), And 50 Pin Cable.

Main Dishes

VCP PARADIGM 3401 This combination platter incorporates the Toshiba XM 3401 drive with one SCSI Ribbon Cable, Kodak Photo-CD Sampler Software, Toshiba SCSI Driver Software, Terminator, one Disk Caddy and one Users Manual...\$610

EXTERNAL SCSI DATA CABLE All the items you see above but housed in our "bullet proof" Paradigm housing...\$695

Prices above are suggested retail.

Side Orders

CREATIVELABS Multimedia Products, the original sound blaster
MEDIA VISION Multimedia Products, thunder and lightning with video and sound
ADAPTEC SCSI Controllers for DOS, Novell and OS/2
KODAK Photo-CD Access Software for true multi-session
COREL SCSI Software takes the indigestion out of daisy chains.
CD-ROM CADDYS will handle your appetite for more CDs.

FOR A COMPLETE MENU OF VCP PARADIGM DRIVE PRODUCTS, INCLUDING TAPE, OPTICAL AND HIGH END NETWORK SUBSYSTEMS FOR MACINTOSH AND PC ENVIRONMENTS, CALL:

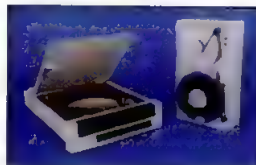
800-392-5836



VCP COMPUTER PRODUCTS
4165 E. LA PALMA AVE.
ANAHEIM, CALIF. 92807

CIRCLE 875 ON READER SERVICE CARD

BEST 9-TRACK TAPE SOLUTION OF THE 90'S!



• PC 286/386/486
• RISC/6000 • AS/400
• SUN • HP • DEC • APPLE

Our name begins with Quality!
Call us today for price and information.

QUALSTAR®

9621 IRONDALE AVE., CHATSWORTH, CA 91311
FAX (818) 882-4081 • (818) 882-8822

CIRCLE 877 ON READER SERVICE CARD

SAVE ON 9 TRACK MAGNETIC TAPE SYSTEM

FOR IBM PC/XT 286/386/486

- Mainframe to PC Data Xfer to 24MB/min
- Complete Software Packages
- Ready to Operate Systems
- Service and Support, Easy Installation
- No. 1 in Customer Satisfaction
- SCSI Bus Interface, UNIX Compatible
- 3480, Cartridge, Tape Duplication Systems
- Data Conversion / Duplication Services
- New/Unused, Reconditioned, Used MTUs

call (919) 763-8400 or write to:
4304 Market St., Wilmington, NC 28403



WILTEC

CIRCLE 878 ON READER SERVICE CARD

NEW! PORTABLE DATA STORAGE

Battery, PS, Charger, & Parallel port inside.
Mac or IBM No cards needed!



60-120MB HD Use alone or with base below as a removable



340MB 1Gig HD



128 256MB 3.5" Cart. Read write Optical State of art



60-120MB HD with battery



44MB or 88MB Squest Cart. Drive



Floptical 20MB cart. 3 hr. Battery optional



2.8 Gig DAT compression 600MB Tape, or 160MB Tape



Single 2Gig or Dual Bernoulli Squest, CD r/w Optical or any combination



52 240MB HD 155 Tape Battery optional



Sony CD ROM NEW High Performance



100MB very fast Maxtor r/w Optical Cartridge Drive Solid State 64-384MB available in same size as above

Liberty Systems

(408) 983-1127
Fax (408) 243-2885

You're ready to work anywhere there's a computer. Send large documents and graphics between locations. Create a multimedia show and take it on the road. There's no end to the uses you will find for these small wonders.

"Microscopic" MACWORLD

CIRCLE 876 ON READER SERVICE CARD

9 TRACK TAPE DRIVES 3480 TAPE DRIVES FOR PC/XT/AT/386/486/PS2

LOWEST
PRICES
BEST
QUALITY



LAGUNA DATA SYSTEMS

7340 Smoke Ranch Road
Suite C
Las Vegas, NV 89128

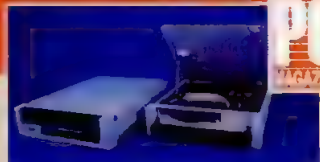


(800) 938-8273
(702) 254-2648 TEL
(702) 254-0910 FAX

CIRCLE 879 ON READER SERVICE CARD

New Products Expand Award Winning Tape System Family!! 3480/3490 NineTrack SCSI Solutions!!

NOW all of the PCTD-1 features that earned PC Magazine recognition as "Editors' Choice" and "the clear winner among nine-track back-up devices" are available with a complete line of NineTrack 3480/3490 SCSI Controller Kit and tape subsystem solutions. Like the PCTD line, the new SCSI line reads/writes to 9-track and 3480/3490 tape with your IBM PC/XT/AT/386, 486, PS/2 and compatibles. Exchange data with other PCs, minis and mainframes using a variety of tape densities.



- 3480/3490 & NineTrack system features:**
- Auto & cartridge load systems available
 - Data transfer rate up to 43.56 MB/minute
 - Interchange & backup software
 - ReelView data extraction & conversion software
 - 800/1600/3200/6250 bpi & 3480/3490 systems available
 - Toll-free direct access to dedicated product line technical support



Computer Logics Limited
31200 Carter St., Cleveland, OH 44132
East Coast: 800-626-0599 or 216-349-8800 • Fax: 216-349-8820
West Coast: 800-626-0311 or 800-626-1020 • Fax: 800-626-1000

Copyright 1993 by Computer Logics Limited. All rights reserved.

CIRCLE 880 ON READER SERVICE CARD

9-Track for PCs

Mainframe to PC data interchange

Rock solid solutions, rock bottom prices.

Direct from the manufacturer. 1600 & 6250 bpi.

Subsystems include drives and software.



800-729-8725

OVERLAND DATA

Since 1980

3480 Now

with IDRC!

Tel 619-571-5555 • FAX 619-571-0982
Europe: Tel (+49) 6172-35027 • FAX (+49) 6172-35028

Ask about 3480 tape drives too

CIRCLE 881 ON READER SERVICE CARD

Largest Selection of Tape Products

PE 9-Track ♦ GCR 9-Track ♦ 3480 Cartridge
TK50/70/85 ♦ 4mm & 8mm ♦ 1/4 Cartridge

**SALES, RENTALS, TECHNICAL SUPPORT,
CONVERSIONS, SERVICE/REPAIRS**

Call for Competitive Pricing!

1-800-362-6250

FAX: 301-330-9510

Gaithersburg, MD

**INTERFACE
SYSTEMS
INC.**

CIRCLE 882 ON READER SERVICE CARD

GoldMine

The Leading Contact Manager for Networks!

GoldMine is the premiere network contact manager on the market. It automates the whole office into an efficient team. GoldMine combines contact management with telemarketing, sales automation, network scheduling and E-Mail to provide a truly integrated system that will change the way your office works!

GoldMine is \$295 for single user, \$895 for the network version, and it's backed by our no-nonsense 60 day money back guarantee!



"...GoldMine is an excellent contact manager. It has far greater LAN functionality than any program I've seen including ACT! & Telemagic"

- Peter Otte, Editor
Mobile Office Magazine

ELAN

17383 Sunset Blvd., Suite 101

Pacific Palisades, CA 90272

1-800-654-3526

Trade-Up to GoldMine for Only \$99!

CIRCLE 884 ON READER SERVICE CARD

OMNI^{drive}™

Minimal memory requirements
Supports hardware and
Microsoft® CD-ROM interfaces
Compatible with DOS 5.0
All compressed data stored in
.ZIP file format
Compressed data format not
obsolete dependent
Windows™ 3.x & 4.x
Transparent compression and
decompression
Virtually instantaneous file
mounting and unmounting

What is OMNIdrive?

OMNIdrive is a revolutionary way to work with archived .ZIP files. Imagine using standard DOS commands to access your archived data.

By utilizing an installable file system (IFS) technology developed by OMNIrelational, OMNIdrive allows you to mount your .ZIP files to DOS drive letters. The IFS makes .ZIP file compression and decompression transparent and real-time.

**Bring your
.ZIP files
on-line!**

Call 1-800-543-6403

ext. 100

Compuserve ID - 71722,3613

Suggested List Price:

\$89.95

OMNIrelational, Inc.

P.O. Box 135

Gladstone, NJ 07934

CIRCLE 883 ON READER SERVICE CARD

JUNE 15, 1993 PC MAGAZINE **437**

PREMIER

MASS STORAGE DEVICES—SOFTWARE/BUSINESS APPLICATIONS

BrainMaker
Neural Networks
give your PC
human skills.



**"BrainMaker is the
most fascinating
computer software
I've ever seen."
John Dvorak
PC Magazine**

Find patterns and hidden relationships in data and learn from the past. Read in data from Lotus, dBase, Excel, binary, and ASCII. Menus, dialog boxes, color, mouse support, great manuals. Stock and bond forecasting, pattern recognition, commodities, futures, and more.

30 day money back guarantee!

BrainMaker is \$195 Professional is \$795
Free Catalog: 800/284-8112, 916/478-9040
California Scientific Software

CIRCLE 885 ON READER SERVICE CARD

ANNOUNCING Computer Select™

The Most Complete
Database of Computer
Product Information
Available

With COMPUTER SELECT you'll never again risk making the costly mistake of acquiring the wrong product. Now, using your own PC, you can identify, evaluate and select the best products that meet your requirements and your budget. Easy-to-use search software lets you quickly retrieve the documents you need from the vast database of product reviews, specifications, announcements and buyer's guides.

Get instant access to more than...

- 70,000 articles and abstracts each month
- Complete specs for 70,000 hardware, software and communications products
- Profiles of 12,000 companies, including addresses and phone numbers
- 9,000 definitions of computer and telecommunications terms.

Discover the power of this new CD-ROM product. Call

now for your free, no-obligation demo disk. Then, if you wish, you can subscribe for \$895.*



One Park Avenue,
New York, NY 10066

**CALL NOW FOR A FREE
DEMONSTRATION DISK**
212-503-4400

Computer Library and Computer Select are trademarks and Data Sources is a registered trademark of Ziff Communications Company. ©1991 Ziff Communications Co.
*U.S. and Canada only. Outside U.S. \$1185

CDROMS \$24.95

■ Simtel MSDOS CDROM

\$24.95*

For just a few dollars, you save time! This disc contains a comprehensive collection of high quality MSDOS programs for every conceivable need. There are more than 9000 programs in 640 megabytes. Programming tools, editors, math and science, graphics, ham radio, modem programs, printer utilities, education, neural nets, sound utilities, tutorials, compression utilities, and much, much more. Many programs include source code, usually in C. All these programs are from SIMTEL, the world's most active Internet node. Made in December 1992.

■ CICA MicroSoft Windows CDROM

\$24.95*

Thousands of programs for Microsoft Windows 3.1. Video and printer drivers, utilities, backup/restore programs, diagnostics. Many programming examples in C, Pascal and Visual Basic. Hundreds of games: video games like tetris and asteroids, strategy games such as checkers and chess, word games, and card games. Bitmaps, icons, screen savers, etc. Made in March 1993.

■ Giga Games CDROM

\$39.95*

The definitive game collection for MSDOS and MS-Windows. Thousands of games of every imaginable variety. Arcade and casino games, strategy and war games, word games. A large selection of educational games for all age groups. Made in March 1993.

■ Hobbes OS/2 CDROM

\$24.95*

Thousands of OS/2 2.0 utilities, drivers, games, etc. The best collection of OS/2 programs available anywhere at any price. Made in November 1992.

■ The C Users' Group Library CDROM

\$49.95

The entire CUG Library. From the earliest CP/M utilities to the latest DOS, Windows and Unix applications. This disc is a tremendous resource for any C programmer. Made in October 1992.

■ CDROM Caddles

\$4.95

* Shareware programs require separate payment to authors if found useful.



Full
money-back
guarantee.
VISA/MC/AE/COD

Walnut Creek CDROM

1547 Palos Verdes, Suite 260
Walnut Creek, CA 94596

1-800-786-9907 ■ +1-510-674-0783 ■ FAX +1-510-674-0821
info@cdrom.com

CIRCLE 887 ON READER SERVICE CARD

If You Need to Communicate...



Sample of VT-340 graphics, configurable toolbar, and keyboard mapper.

DynaComm 3.1 includes:

- ◆ DEC VT-340
- ◆ 16 terminal emulations
- ◆ 19 network connectors including TCP/IP
- ◆ 10 transfer protocols
- ◆ 300+ script commands
- ◆ Technical support

And who doesn't? Today's fast moving corporate world demands quick, easy access to mainframes, minis or other PCs. DynaComm provides the most powerful WINDOWS™-based communication features.

Microsoft agrees: they selected DynaComm as their world-wide standard for data communications. So if you need to be in touch with the rest of the world or just the rest of your company...

**...We Need to
Communicate.**



FutureSoft.

1001 South Dairy Ashford, Suite 101 • Houston, Texas 77077
713 496 9400 • 713 496 1801 FAX

1-800-989-8908

Retail \$249 (Network pricing available)

WINDOWS is a trademark of Microsoft Corporation.

FutureSoft and DynaComm are registered trademarks of Future Soft Engineering, Inc.

CIRCLE 886 ON READER SERVICE CARD

DOS

**FREE
ISSUE!**

Inside DOS is guaranteed to help you get the most out of DOS. But don't take our word for it. See for yourself.

Subscribe today and you'll get 13 issues for the price of 12 for only \$39! If you decide *Inside DOS* is not for you, mark "cancel" on your invoice and return it. Your free bonus issue will be yours to keep with no further obligation.

Call for your FREE ISSUE today!

1-800-223-8720

Please mention code V5NY

Music Machine

Turn your PC into a powerful
Music Workstation with our
full-line of PC MIDI products.

Try our \$19.95 DemoPak and
apply the cost when you buy
software from us.

Voyetra Dept. PCM
333 5th Ave
Pelham, NY 10803
(914) 738-4500 Fax: 738-6946
Orders/Catalog: 1-800-233-9377



CIRCLE 888 ON READER SERVICE CARD



Free CD-ROM Disc!

Demo and Test contains 350 megs of PC Shareware & PD software. Including Special CD-ROM Benchmark & Test Utilities written by our programming staff, and NOT available on any other CD-ROM Discs. Our Special Test Utilities measure throughput as well as access times in a reliable and consistent manner for a meaningful real-world benchmark for CD drives. The Disc and Interface Software are fully functional (even for BBS use) and not crippled in any way. When purchased separately Mega Demo & Test is \$14.00 plus \$6.00 for S&H - However for a Limited Time Only this Demo and Test CD-ROM Disc is Free with any CD Disc purchase.

These are the Only Shareware & PD CD-ROM Discs with both a DOS, and a Windows 3.1 "Hypertext" Retrieval Interface. Plus All CD Discs are BBS Ready, and Include files.bbs plus our BBS Door with a "Remote User" Mouseable Pull-Down Menu Interface.

fao
Gold™

Best of the Best



fao.

Volumes 1, 2, & 3

For Adults Only
"Wife Proof Labels"
Over 600 MegaBytes
Many Not On FAO 123
256 Color SVGA Gif's
With No BBS Logos!
Plus Animated
Fl's, Gl's, & D's,
Includes Games, &
ASCII Fantasy Text
Retail Price \$79.00 ea.

Now, for a Limited Time Only
"The Best of the Best" Only!

\$39.00 ea.

For Adults Only
"Wife Proof Labels"
256 Color SVGA Gif's,
Plus Animated
Fl's, Gl's, & D's,
Includes Games, &
ASCII Fantasy Text.
3 Disc Set 1,892 Megs
Over 16,000 Files!
Retail Price
Full Set All 3 \$199.00

Now, for a Limited Time Only
Full Set All 3 Only!

\$69.00 set

Mega
CD-ROM²

PC Shareware Spectacular

650 Megs
7,000 Virus Free Files
65% different or newer
files than Mega CD-ROM1

Mega
A/V¹

PC Audio Visual

Over 600 Megabytes
of PC Graphics & Sounds
256 Color Gif's, Animated Fl's plus
.Mod, .Roi, .Wav & .Voc Sound Files
Our Newest Release!

Mega
WinOS/2^A

Windows and OS/2 Shareware

600 Plus Megs of Windows & OS/2
Shareware With Over 4,860 Files!
Plus MegaWin Windows 3.1 Interface
Retail Price \$79.00 for Each Disc

Now, for a limited time only!
\$29.00 each
or get all 3 of these fantastic
MEGA CD-ROM Discs for only!

\$69.00

SONY Caddies \$4.75 with any Non Demo CD purchase!

The prices listed above do not include shipping and handling.
Special shipping and shipping to foreign countries is available.

Questions & Dealer Information Call (602) 577-9696



ORDERS ONLY! Call Toll Free

1-800-843-7990

PROFIT PRESS, 2956 N. Campbell Ave., Tucson, AZ 85719
Information (602) 577-9696 FAX (602) 577-9624
Profit Press BBS (602) 299-0693 FAO BBS (602) 577-6969

CIRCLE 889 ON READER SERVICE CARD

New Grammar Module for Language Learning • New Grammar Module for Language Learning • New Grammar Module for Language Learning • New Grammar Module for Language Learning

POWER TRANSLATOR™

ENGLISH to/from SPANISH, FRENCH & GERMAN

Make Your PC Multilingual!

Translate everything from legal documents to technical manu-
als; requests for quotation to distributor memos; at a price
easily within reach of a personal user. New Gram-
mar Module provides *interactive* foreign lan-
guage education for students, business
executives and government
administrators.

Your Competitive Edge in the new international market place is POWER TRANSLATOR.

Talk to your software supplier or call **Globalink** direct:

1-800-255-5660

NOW
JUST
\$299



MULTI-MEDIA-PERSONAL

CIRCLE 890 ON READER SERVICE CARD

COMPLETE BIBLE BOOKSTORE ON DISK!



JUST DIAL
1-800-423-1228
FOR YOUR
Free Catalog!

BIBLE RESEARCH SYSTEMS

2013 WELLS BRANCH PKWY. # 304 • AUSTIN, TEXAS 78728

CIRCLE 891 ON READER SERVICE CARD

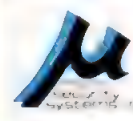
SOFTWARE
SECURITY

(800) 456-2587

Stop lost profits with SecuriKey

— a unique hardware device that prevents unauthorized use of computer software.

- IBM, compatible & Macintosh
- Allows unlimited backup copies
- Does not permit duplication
- Available in custom colors & logos
- UNIX/XENIX/Serial Device



150 Wright Brothers Drive, Suite 560
Salt Lake City, Utah
84116-2847

CIRCLE 892 ON READER SERVICE CARD

Design customized arrays with industry-standard products!

CoreRAID implements RAID 4 and 5 in a software solution!

Improves access time of all hard drives in array by grouping data by frequency of use. Increases array performance 30%.

Lowest hardware cost. Compatible with 40MB, or 100MB hard drives. Software 2.11

CORE RAID!

The Software Solution for Data Security!

CoreRAID is a revolutionary, cost-effective way to protect your network data. Expensive hardware arrays are no longer necessary because CoreRAID software lets you design *customized* hard drive arrays. Use any ASPI compatible SCSI controller and three or more SCSI hard drives to build arrays that ensure fault-tolerant network performance with minimum disk space overhead. Now you can "hot-swap" failed hard drives to repair arrays with no down time.

Installs in minutes!



\$995

1-800-836-SCSI

CALL TOLL FREE 24 HOURS

Supports any ASPI compatible SCSI controller and any SCSI hard drive!

Fast and easy installation — install several arrays in minutes!

Removes errors, alerts system administrator of drive failure — repair arrays without down time!

Writes of array constantly updating to newest version!

CIRCLE 894 ON READER SERVICE CARD

ARE YOUR HARDWARE LOCKS GIVING YOU TROUBLE?

Numerous software programs on the market use electronic physical lock devices, presumably to prevent unauthorized execution. However if you experience a problem with your lock, you may incur costly hours of lost production time.

CAN YOUR BUSINESS AFFORD TO TAKE THIS RISK?

SafeSoft Systems specializes in producing quality software and hardware products to eliminate the need for lock devices. Our products are designed as insurance to protect your software investment against costly downtime in the event your lock device is stolen, lost, damaged or fails. Lock devices are made from static sensitive CMOS circuitry that is subject to physical and human mishap. Listen to what just a few of our satisfied customers have to say.

"we had to shut down productivity for 3 days waiting for the SIM to be repaired."

Robert S., Denver, CO.

"we have experienced key failures on both systems, costing several days of production resulting in lost revenue."

John T., Charlotte, NC

"the time involved sending the defective key back and waiting for a new key, the cost far exceeds the price of your program."

Roy R., Wrentham, MA

Don't take unnecessary risks! Try our Intelligent Printer Port

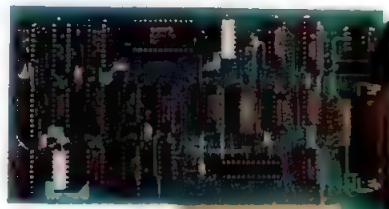
These intelligent printer ports will not only add or replace a regular printer port, but comes with intelligence to emulate most of the current Rainbow Technologies* lock devices.

Try our printer card for 30 days, if you're not satisfied for any reason we will refund your money. All hardware products come with a 1 year guarantee.

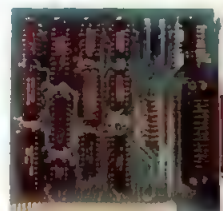
SAFESOFT SYSTEMS INC.

201-1111 Munroe Avenue
Winnipeg, MB Canada R2K 3Z5
Ph. 204-669-4639 or Fax 204-668-3566

The P-CARD
will emulate the SentinelPro



The C-CARD
will emulate the SentinelC and Sentinel Scribe



Important: SafeSoft Systems products are intended for licensed software users and must not be used to violate any license agreement.

*Rainbow Technologies is not affiliated with SafeSoft Systems Inc. SentinelPro, SentinelC and Sentinel Scribe are registered trademarks of Rainbow Technologies.

CIRCLE 893 ON READER SERVICE CARD

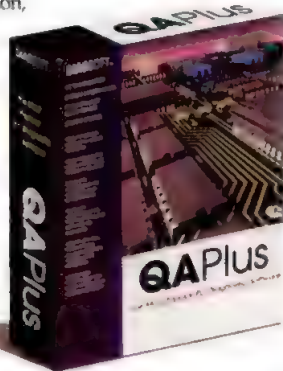
PC Diagnostics and System Information

QAPlus™ Over 3 Million users

- ❑ New Version 4.7 now includes Reachout™ Host remote control software
- ❑ Both novices and expert PC users can quickly solve common computer problems
- ❑ Reports hardware configuration, interrupts, performance benchmarks and more
- ❑ Includes LAN features for networked PC support and management

For More information call:
1-800-DIAGSOFT

Competitive upgrade and tradeup pricing available too.



Also from DiagSoft: QAPlus/WIN™ for tuning and troubleshooting Windows™ and QAPlus/FE™ for power-users and service/support professionals.

Available from Egghead Discount Software, Comp USA, Biz Mart, Fry's Electronics and other fine resellers.

DiagSoft, Inc., 5815 Scotts Valley Drive, Suite 140, Scotts Valley, California 95006 • 1-800-438-8247 • FAX 1-408-438-7113
Suggested Retail: \$159.95

CIRCLE 895 ON READER SERVICE CARD



SuperVGA

Computer Images

Also VGA/EGA/CGA/Mono and Animation

1024x768x256

Photographic Quality Real Color Images

BBS

1-800-GO-MODEM
Toll-Free Lines

Exclusive from Event Horizons. 50,000 top quality, state of the art color MaxiPic GIF images and Sound VGA Movies, all categories, ratings, resolutions.

BBS 800-GO-MODEM,
or BBS 503 697-5100. \$12/hr.
Toll-Free lines \$6/hr extra

No Modem? Order our Mail Image Library with Samples for \$9. World-wide shipment. Info voice line 503-697-7700. Credit cards accepted. Same day shipment anywhere.



Actual computer scanned images

Event Horizons

311 Ave B, Suite 208
Lake Oswego, OR 97034
Information: 503-697-7700



CIRCLE 896 ON READER SERVICE CARD

FREE DOWNLOADS!

FOR FIRST-TIME USERS

- EASY TO USE FULL SCREEN MENUS
- DEMONSTRATION APPLICATIONS
- HUNDREDS OF PROGRAMS AND FILES
- INTERNATIONAL COMMUNICATIONS
- ACCESS VIA WINDOWS TERMINAL
- FULL COLOR
- FAST SEARCH
- WINDOWS SHAREWARE
- COMPUTER PRODUCTS LISTINGS
- PUBLIC FORUM

NEW PROGRAMS ADDED EVERY DAY! ALL YOU NEED IS A MODEM!

To call from Windows terminal (under accessories)
ISBBS phone number

- 1-914-997-5148
- Terminal preferences: unselect "use function, arrow and cursor keys" for Windows
- make sure modem is connected to COM port and line
- communications: set baud rate and connector
- password (after connection established): TISBBS

Settings for other programs
(standard in Windows)

- terminal emulation: VT100
- transfer protocol: XMODEM-CRC
- Communications: BN1
- For detailed instructions
FAX • 1-914-997-5148



60 East Main Street, Suite 200, Yonkers, NY 10550 • USA

CIRCLE 897 ON READER SERVICE CARD

Get on the Internet!

5 Hours FREE!

DELPHI is now connected to the Internet! With over 4 million users, the Internet is the fastest growing and most talked about online resource in the world.

- **YOURNAME@delphi.com** — use DELPHI's real-time e-mail connection to send messages or subscribe to mailing lists.

- **Telnet** — connect to colleges, companies, and other networks.

- **FTP** — transfer files immediately from other hosts.

Here's How:

Dial by modem
1-800-365-4636

At Password,
type PMG36A

Questions? 1-800-695-4005

CIRCLE 897 ON READER SERVICE CARD

ROMVLVS ENTERTAINMENT

New CD-ROM Product

Introducing The First FULL LENGTH Feature Film Available For The PC
Video Compression Breakthrough!

- Full screen
- 30 Frames per Second
- 100% Software Driven
- Sound & Video Cards Not Required
- Windows Not Required
- 90 Minutes Running Time
- Uncut and Unedited
- 386 Or Better and CD-ROM Drive to Run
- Using the Most Advanced Compression Technology

Must be 18 to order



HIDDEN OBSESSIONS
ANDREW BLAKE
A FIVE STAR ADULT PRODUCTION ON FILM

INTRODUCING FROM THE PAGES OF PENTHOUSE
JANINE LINDEMULDER

ID # CD7001 Suggested Retail \$69.95 Premier at Intermedia '93 Booth 944

MC ORDERS 1-800-695-4005 DEALER INQUIRIES 1-800-695-4005

ROMVLVS ENTERTAINMENT 2040 Broadway Santa Monica, CA 90404

CIRCLE 899 ON READER SERVICE CARD

UTILITIES—INFORMATION RESOURCES—ADULT



MAPEXPERT™

Your Route to Increased Productivity

MapExpert gives you a street-level map database of the entire United States and the tools to customize and print an unlimited variety of maps for every business need. One CD-ROM lets you:

- Locate areas by zip code, phone number, or place name
- Zero in on individual streets anywhere in the country
- Identify address ranges in major metropolitan areas
- Customize maps with graphic and text overlays
- Find latitude and longitude for any location
- Print high-quality maps in color or B&W
- Print mural maps...and more!

MapExpert's uses for increasing your business productivity are endless. Define delivery routes, outline sales territories, map out expansion strategies, plan property development, make nationwide travel plans, and more!

Only \$495

Order Today

800-452-5931

ext. 8153

30-Day Money-Back Guarantee



"...MapExpert is an amazing bargain."

DeLorme Mapping Company - Lower Main St. - Freeport, ME 04032



CIRCLE 900 ON READER SERVICE CARD



Cakewalk

PROFESSIONAL
for Windows

The 256-track MIDI sequencer for Windows 3.1.

- Supports multimedia sound and MIDI cards with Windows 3.1 drivers
- Plays back digital audio (.wav format) on compatible sound cards
- Runs MCI (Media Control Interface) commands during playback
- Displays MIDI notes in staff, piano-roll, measure, and event-list views
- Graphically displays velocity, volume, other Controller events
- Has built-in programming language for custom editing
- Just \$349 Demo disk available for \$10

Sound Card Owners—Save \$100!

Trade in your sequencer disk—call for details

800-234-1171 or 617-926-2480



P.O. Box 760, Watertown, MA 02272

CIRCLE 902 ON READER SERVICE CARD

Is the pressure on to justify how you spend your training dollars?

In these days of tight budgets, you need solid proof of the value of training.

That's why Logical Operations has developed the Skills Evaluation Series™ software-skills tests that you can use to assess basic software skills, screen to determine training requirements, and measure training effectiveness.

Each Skills Evaluation contains 20 multiple-choice questions with a manually or automatically scored answer card. Most evaluations are "hands-on," where students must be using the actual software and the sample files provided in order to complete the evaluation.

Fully validated, and designed to work with Logical Operations' classroom training materials (if you use them!), Skills Evaluations are available for most major software applications including, **Word for Windows, WordPerfect 5.1, Macintosh Orientation System 7, PC Literacy, 1-2-3 Release 3.1, Windows 3.1 Orientation, and Excel 3.0 for Windows.**

At only \$78 for a Skills Evaluation Starter Package, you'll get an information-packed Administrator's Guide, answer key, and a 10 pack of tests. Additional 10 packs are available for \$50.

Skills Evaluation Series

Order now — it might prove to be the most cost-effective thing you'll do today
Call 1-800-456-4677, ext. 40
to receive a **FREE** evaluation,
and prove the value of your training today



Logical Operations
Learn from us

Skills Evaluation Series is a trademark of Logical Operations. All other copyrights and trademarks are registered trademarks of their respective owners.

ROMDISK™

SOLID STATE

Disk and Drive Emulators

- **Proven Performance!** For OEM/Military, Embedded Systems, Diskless/High Performance PC's, CAD/CAM, Industrial Control, Medical, POS, LAN's, etc.
- **High Capacity Models** (PCF/PCM)
- **Low Cost Models** (FERO, E/2-SR/Special OEM)
- **Dual Mode Emulation Models** (PCF, PCM/2, PCE/2)
- **Autoboot Capabilities**, all models
- **MS DOS/DR DOS/E-Venix OS Support**
- **NEW! PCMCIA models (PCM, PCM/2) and accessories**

.....CURTIS, INC.

Industry Leader in Disk and Drive Emulation Products

418 W. County Rd. D **612/631-9512**
St. Paul, MN 55112 **FAX 612/631-9508**

DR DOS is a trademark of Digital Research
MS DOS is a trademark of Microsoft

CIRCLE 576 ON READER SERVICE CARD

FTI

Design House Offers Low Price & High Quality Motherboard & System Products

Motherboards for upgrades

486/66, 256K EISA/VESA	\$930
486/66, 256K, Local Bus	\$830
486/33, 256K, Local Bus	\$830
486/50, 256K Cache	\$870
486/33, 128K Cache	\$490
486/33, 128K Cache	\$390
486SX/25, 128K Cache	\$300
386DX/40, 128K Cache	\$190
386SX/25MHz	\$100
286/20MHz	\$65

Bare Bone Systems

486/50, 256K \$895, 486/66	VESA \$1050
486/33, 128K \$710, 486/33	VESA \$750
286/40, 128K \$410,	
-Motherboard	
-4MB Memory	
-Mid Tower Case/220W PS	
386SX/33MHz	*****\$248
286/20MHz	*****\$218
-Motherboard	
-2MB Memory	
-DeskTop Case/220W PS	

Accessories

1Mx9-70 SIMM	\$33
4Mx9-70 SIMM	\$150
1 2FD or 1.44FD	\$60
101 Keyboard/\$30, Serial Mouse	\$15
Sound Blaster Compatible	\$65
Mitsumi CD-ROM	\$235
Panasonic CD-ROM	\$335
32-bit VESA LB SVGA/1MB	\$165

IDE 2FD/2HD with 25/1P/1G I/O	\$25
IDE 2FD/2HD Controller	\$20
AT 25/1P/1G I/O Card	\$15
Desk Top Case /200W	\$80
Mid Tower Case/220W	\$90
Full Tower Case/250W	\$130
14" SVGA Monitor	\$285
SVGA Card/1M	\$70

Call 1-800-448-2031

PO, COD, M/C, Visa & Discover Accepted
Mon - Fri 8:00 - 6:00 (MST)
Saturday 9:30 - 1:30 (MST)

We offer 30 Days Money Back & 1 Year Warranty. Toll Free Technical Support

FLASH TECHNOLOGY INC

55 W Hoover Ave #9
Mesa, AZ 85210
Fax (602) 464-9856

CIRCLE 500 ON READER SERVICE CARD

ICs PROMPT DELIVERY!!!

SAME DAY SHIPPING (USUALLY)
QUANTITY ONE PRICES SHOWN FOR FEB 28, 1993
Memory for almost ALL computers

DYNAMIC RAM

PS2 2533	4MB	80ms	\$150.00
PS2 664	2MB	80ms	90.00
SIMM	4MB	70ms	145.00
SIMM	1MB	40ms	88.00
SIMM	1MB	60ms	40.00
SIMM	1MB	70ms	38.00
4 Mbit	4Mx1	80ms	21.00
4 Mbit	1Mx4	80ms	19.00
1 Mbit	Mx1	70ms	4.75
41255	256Kx1	80ms	1.95
44256	256Kx4	80ms	5.00

EPROM

D26F010	128Kx8	150ms	\$24.00
27C1000	128Kx8	200ms	7.50
27C512	64Kx8	120ms	4.75
27L128	16Kx8	250ms	2.95

STATIC RAM

4 Mbit	512Kx8	Pseudo	\$27.00
1 Mbit	128Kx8	Real	\$18.00
62256LP	32Kx8	100ms	5.50

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

DOLPHIN MICROCOMPUTER CORPORATION

1234 SOUTH ST. LONG BEACH, CA 90805

TEL: 310-422-4444

FAX: 310-422-7676

XT 12MHz 1MB RAM 40MB MONO SYS \$455

286 25MHz 1MB RAM 40MB VGA MONO SYS \$588

386SX 33MHz 4MB RAM 130MB SVGA SYS 999

386 40MHz 4MB RAM 130MB SVGA SYS 1099

486SX 25MHz 4MB VESA 130MB SVGA SYS 1233

486 33MHz 4MB RAM 170MB SVGA SYS 1456

486 50MHz 4MB RAM 200MB SVGA SYS 1666

486DX2 66MHz 4MB VESA 200MB SVGA SYS 1834

TWIN-HEAD NOTEBOOKS ALL MODELS Call

ACER COMPUTERS ALL MODELS Call

MOTHERBOARDS 386SX, 386DX, 486, Call

W. DIGITAL WD2200 212MB IDE HD 281

W. DIGITAL WD2250 255MB IDE HD 303

W. DIGITAL WD2340 340MB IDE HD 439

CHINON 1.2MB FLOPPY DRIVE \$25 48

CHINON 1.44MB FLOPPY DRIVE 3.5" 45

FUJITSU 101 CLICK KEYBOARD 41

NANAO 9080, F550, T560, 9400, T660, F750 Call

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

Microprocessors Unlimited, Inc.
24 000 S. Federal Ave. #8555, OK 74121-1918 (918) 267-9961

486-66 MHz EISA

Since 1985, MSE has been dedicated to bringing you high-quality American designed, engineered and built computer systems for a wide range of applications. NOW, for our 8th year anniversary special, we are proud to introduce our fastest and most powerful machine, the 80486-66MHz or 33MHz.

- MicroCache 3**

KINGS COMPUTER TECHNOLOGIES

Complete System Prices

• 386SX/25	\$995
• 386SX/33	\$995
• 386SX/40	\$995
• 386DX/40	\$1100
• 486SX/25	\$1295
• 486DX/33	\$1495
• 486DX/50	\$1795

Rubbermaid Furniture & Desk
Systems Starting at \$125

All Systems Include:

- * 1 5.25 High Density Drive
- * 1 3.5 High Density Drive
- * 1 Parallel, 2 serial, 2 com ports
- * 1 105 meg, 15MS IDE Hard Disk Drive
- * 1 Floppy Hard Disk Controller
- * SVGA Monitor (391 w/512K monitor card
- * 101 Key Keyboard
- * Motherboard Upgradeable
- * 2 Year Parts & Labor
- * 4 Meg 70NS Simm's

Business Leasing Available. Fortune 500 purchase orders
accepted. Government purchase orders accepted.

Motherboards

386SX/25 w/256K Cache	\$135 ⁰⁰
386SX/33 128K Cache	\$170 ⁰⁰
386SX/40	\$190 ⁰⁰
486 DLC	\$280 ⁰⁰

Memory

1x3 70NS	\$4000
1x8 70NS	\$4250

Software

TURBO TAX	\$65 ⁰⁰
TAX CUT	\$53 ⁰⁰
MICROSOFTWORKS	\$129 ⁰⁰
NORTON UTILITIES	\$105 ⁰⁰
MICROSOFT MONEY	\$15 ⁰⁰
QUICKEN FOR WINDOWS	\$35 ⁰⁰
INSTANT ARTIST	\$59 ⁰⁰
STAR TREK SCREEN SAVER	\$50 ⁰⁰
AFTER DARK SCREEN SAVER	\$29 ⁰⁰
Authorized Canon Dealer - Canon LBP20	\$300

311 North Gray, Kilbuck TX • 817-554-5464 • FAX 817-554-5474

CIRCLE 582 ON READER SERVICE CARD

Up to 43% off!

IBM PS/2's

	IBM Retail	Your Cost
MODEL 30-286/E01	OMB	1,625 395
MODEL 35-040	OMB	1,310 875
MODEL 55-081sx	80MB	2,000 1,150
MODEL 57-045	80MB	1,950 1,395
MODEL 70-081	80MB	2,075 1,475
MODEL 70-A81	80MB	2,275 1,650
MODEL 80-081	80MB	3,825 2,550
MODEL 80-A31	320MB	5,825 3,475
MODEL 90-0K9	160MB	3,730 3,225
MODEL 95-0K0	320MB	4,958 4,250
MODEL 95-0K6	400MB	5,250 4,500
8512/8513		325/350

We also carry the FULL IBM, COMPAQ and H.P. Lines
Call For Latest Pricing

AMERICAN MICRO COMPUTER CENTER

8073 NW 167th Street • Unit C-27
Miami, FL 33015

PH: (305) 825-5565 FAX: (305) 825-7774

CIRCLE 583 ON READER SERVICE CARD

Bar Code & Magnetic
Stripe Readers

For PC/XT/AT, PS/2, and RS-232 Interface



- Direct keyboard interface, no software change
- Reads UPC, EAN, Code 39, 11, 128, 125, Codabar, MSI
- Direct from manufacturer, 30 day money back guarantee
- Reader with steel wand - \$299, with Magnetic Strip Scanner - \$199
- Bar Code labeling software from \$99
- Reseller discount available, direct from manufacturer

IBS-Intelligent Barcode Systems

(800) 765-2271

16031 Kaplan Ave., City of Industry, CA 91744
Tel: (818) 958-6265 Fax: (818) 958-5527BAR CODE READERS
AMERICAN MICROSYSTEMS

2190 Regal Pkwy. • Euless, Texas 76040 • (817) 571-9015

FOR PC, XT, AT, PS/2 & TERMINALS

MAG
STRIPESLOT
(BADGE)

WAND



DECODER BOX



- ▶ No software changes required
- ▶ Data appears as keyboard input
- ▶ Reads Code 39, I-2of5, UPC/EAN, Codabar 11, 93, 128, MSI/Plessey
- ▶ Auto-discriminates between codes
- ▶ Accepts WAND, SLOT, MAG STRIPE, CCD, LASER
- ▶ Easy To Use



LASER



CCD

METRO
LASER

BAR CODE PRINTING SOFTWARE:

- ▶ For Epson, OKI, IBM, Dot Matrix and HP LaserJet Printers
- ▶ Prints Code 39, I-2of5, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey

PORTABLE READERS:

- ▶ Use as a portable, wedge or terminal
- ▶ Input Devices: WAND, CCD, or 5V LASER
- ▶ Real-time clock for date and time stamps
- ▶ Automatic power off with resume
- ▶ "Built-In" Inventory programs
- ▶ 54 key alpha/numeric keyboard
- ▶ Supports HAYES compatible modems

(800) 645-4452 • FAX: (817) 685-6232
30 Day Money Back Guarantee
One Year WarrantyBar Coding
for WindowsCode 39 Code 93 Int 2 of 5 PostNet
Code 128 Codabar MSI-Plessey UPC/EANCompatible w/Windows Programs
Postscript & TrueType Fonts
Easy-to-Use
30 Day Guarantee
\$149 each + S&H

Readers from \$249

Call for FREE information

512.590.9528

10902 Forest Smt, San Antonio, TX 78233

riversedge

CIRCLE 584 ON READER SERVICE CARD

BAR CODE PRINTING

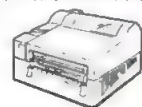


1 (800) 232-7625

- Bear Rock Labeler™ Windows labeling program with eleven bar code symbologies.
- PrintBar™ Bar code font packages for the Macintosh.
- PrintBar II™ Dos memory-resident bar code package for PCs.
- PrintBar SoftFonts™ Soft font package for LaserJet printers.
- PLUS: Source code, readers, scanners, and much more!

For more information call:

1-800-232-7625

4140 Mother Lane Drive • Shingle Springs, CA 95682
(916) 672-0244 • FAX (916) 622-4775Electronic
Scales &
Bar Code
PrintersQuality retail peripherals for
PC's from the worldwide
leader in POS
systems, bar
code printers
& scales.

TEC America, Inc.

Fax: (310) 329-1490

Phone: (800) 432-6414

19300 Hamilton Ave.

Gardena, CA 90248

Product info available by fax

CIRCLE 585 ON READER SERVICE CARD

THE NEW
PC MAGAZINE
CLASSIFIED FORMAT
GIVES YOU
MUCH MORE
FOR FAR LESS...New Flexible Ad Sizes
More Color Options
Lower Cost-per-Inch RatesCall your
PC Magazine Marketplace
account representative
today at:

1-800-825-4237

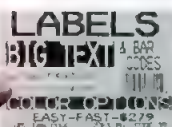
and let the new
Classified work for you.

Bar Code Headquarters

Offices in USA
and Europe!

Labeling Software

For PC with Dot Matrix or LaserJet



- Any Format, Any Size Label
- WYSIWYG or Text Design
- Easy, Powerful

- Formats for Sears, K-Mart, Penny's, WalMart, TCIF, Logmars, AIAG, etc.
- Bar Codes: UCC-128, UPC/EAN, 2of5, MSI, 11, Codabar, Code 128, and Code 39
- Big Text and PCX Graphics too!
- Powerful, Versatile, Easy to Use
- Imports ASCII data files from dBase, etc.
- Above Label Printed by LabelRIGHT™ - \$279
- Other menu driven programs from - \$129

Thermal Transfer Printer with Labeling Software



- Fargo's Allegro Thermal Transfer Printer
- Up to 4" label width
- Small size, only 20 lbs.
- Prints UPC/EAN, 2of5, Codabar, 128, Code 39

- Prints scalable text and PCX graphics
- Packaged with LabelRIGHT Thermal software, serial cable, ribbon and labels
- Complete package, ready to use - \$1895

WORTHINGTON
DATA SOLUTIONS

Portable Bar Code Readers

for PC, XT, AT, PS/2, Macintosh,
and Serial Interface Computers

- Battery Operated Reader — 3 AA Cells
- 64K or 256K memory
- Keyboard or Serial Interface upload
- Downloaded Tables
- XMODEM upload
- Codabar, UPC/EAN, Code 128, 12of5, MSI, Code 39
- Real Time Clock for date/time stamps
- Double duty as Non-portable Reader
- 2 Built-in Inventory Programs supplied or write up to 3 user defined programs
- Long Battery Life — 30,000 wand scans
- Very Easy to Program Custom Prompts.
- Complete 64K unit with Laser — \$1734
- Complete 64K Unit with Wand — \$799



Bar Code Readers

for PC, XT, AT, PS/2, Macintosh
and RS-232 Terminals



- Attaches as 2nd Keyboard
- UPC/EAN, Code 128, 2of5, MSI, Code 39
- Wand, Magstripe, CCD, Slot Badge or Laser
- All European Keyboards Supported
- Superior Read Rates. Made in USA.
- Top Rated by Independent Reviews
- Complete with Symbol Laser — \$1389
- Complete with Steel Wand — \$399
- Complete MagStripe Units from — \$219

Ordering is Easy!

- Made in the USA
- Free "800" Support
- Qualified P.O's Accepted
- 2 Year Warranty on Readers
- Same Day Shipping
- Free UPS Blue in US
- 30 Day Money Back Guarantee

In US or Canada Call Toll Free

800-345-4220

In Europe call information for Toll Free numbers to our Swiss Office

Swiss Office:

Rutistrasse 6
9050 Appenzell, Switzerland
71 87 51 17 Fax • 71 87 51 15

US Office:

3004 Mission Street
Santa Cruz, CA 95060
408-458-9364 fax • 408-458-9938

ITS

Your One Stop Source for Bar Code Solutions

Quality • Performance • Value

ITS

Low Cost Software Reader

NEW!

- Eliminate external box with decoding software.
- No power supply needed for notebook/ laptop.
- Windows version available.



Select the Scanner You Need

- All types, configurations, sizes.
- Largest selection of Hewlett-Packard wands available.
- Lasers, CCD, slot, wand
- and POS/Retail Table-Top scanners.
- HP wands with built-in decoders.

NEW!



Easy-to-Use Labeling Software

- For all dot matrix, laser, and bar code printers.
- Available for Windows and easy to use.
- Suppliers of Zebra and Sato bar code printers.

Low Cost, High Performance, Compact Magnetic Stripe Readers

NEW!

- Versatile: Tracks 1,2,3, BI-directional and durable.
- Excellent for retail and industrial usage.
- RS232 and PC Wedge versions and encoders.



Value Packed Portable Terminals

NEW!

- Easy to upload data and to program.
- MS-DOS compatible terminal available.
- Multi-memory options battery backup.

Bar Code Readers for PC, XT, AT, PS/2, Mac, Compatibles, RS 232, Industrial Terminals, Networks

- Plug and play. • Easy Setup.
- No software needed.

30 Day Money Back Guarantee! Variety of Payment Options! Toll Free Technical Support! Next Day Delivery! Over 100,000 Satisfied Users! Lifetime Technical Support! Full 2 Year Warranty on Readers and Wands!

International Technologies & Systems

9201 Forest Hill Avenue, Suite 108, Richmond, VA 23235 • 655K No. Berry St., Brea, CA 92621
CALL US! Eastern USA (800) 826-1688 • Western USA (800) 228-9487

CIRCLE 506 ON READER SERVICE CARD

FREE PC TRAINING CATALOG!

Choose from 3000+ videos, software tutorials and audio cassettes. Train your staff on Lotus, WordPerfect, Windows and more... starting at \$39.95! Call now to receive your free training catalog or write:



Elin Computer Resources, Inc.
100 Walnut Street
Champion, NY
12919-9790
Fax:
(514) 483-1754

800-363-7759

CIRCLE 507 ON READER SERVICE CARD

The Mail Order Wizard

A complete order-processing system for any size mail-order company. Includes list management, charge-card approvals, UPS manifest, and reports galore!

Systems from \$495 to \$6995

Call for free information or \$20 demo. See why *Home-Office Computing* awarded the Wizard ☆☆☆

The Haven Corporation
802 Madison St., Dept. M93
Evanston, IL 60202-2207
800-860-0098
(outside the U.S. 708-869-3553)

CIRCLE 588 ON READER SERVICE CARD

CHURCH SOFTWARE

Discover for yourself why more churches are choosing **Power Church Plus**™

Try out the leading membership and accounting package.

Call today for your **free full-working Demo.**

F1 SOFTWARE,
208 Ridgefield Drive,
Asheville, NC 28806
(800) 486-1800

CIRCLE 590 ON READER SERVICE CARD

Earn \$4,000 Per Month From Your Home With A Computer!



FREE CBSI 486 SX Business Computer

Quit spending money on your computer and let it earn money for you. This is a proven turnkey business an individual or couple can run. If you purchase our software and business program, we will give you the computer and printer. If you already own a computer, you may receive a discount. Begin part-time and still retain the security of your present position. We will provide free, home office training. Financing available.

To receive free cassettes and color literature, call toll-free:

1-800-343-8014, ext. 318

(in Indiana: 317-758-4415) **Computer Business Services, Inc.**

CIRCLE 593 ON READER SERVICE CARD

THE DATA ENTRY SOFTWARE SYSTEM FOR PCs

KeyEntryIII®

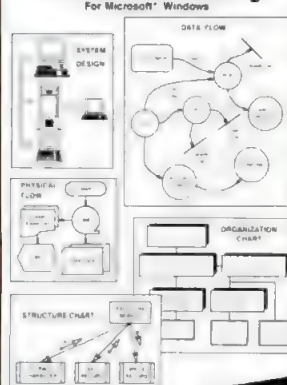
Announcing Version 6.0!!

- Completely revised and redesigned documentation
- Totally new user interface
- New pull down menus, windows, and dialog boxes
- Powerful editing capabilities
- Enhanced data formatting capability
- Upgradable to ImageKey™ for image-assisted data entry

Call 800-533-6879 for more information!

SCS SOUTHERN COMPUTER SYSTEMS, INC.
205-251-2985 ■ FAX 205-322-4851
In UK SCS Europe Ltd
0753 536550 ■ FAX 0753 536765

RFFlow Professional Flowcharting



Create professional, fine quality charts quickly and easily. Call for free trial disk: (303) 663-5767 FAX (303) 669-4889

\$129.00 RFF ELECTRONICS
1051 Bayview Court, Lakeland, CO 80538

CIRCLE 591 ON READER SERVICE CARD

PC DATA ENTRY FOR ALL APPLICATIONS

- End-user data entry
- Replaces key-to-disk systems
- Menu-driven edit selection
- Easy form design
- LAN or Stand-Alone
- Toll-free support hotline

DATALEX

800-962-8888

415-362-4466 ■ FAX 415-362-5733
from Canada 800-848-5548

ENTRYPOINT

CIRCLE 594 ON READER SERVICE CARD

B.S. & M.S. In Computer Science

- ALL COURSES HOME STUDY
- Approved for tuition reimbursement by leading corporations
- Increase your earning power
- Join students from leading computer companies
- Approved Ada course available

FOR FREE INFORMATION CALL
1-800-767-AICS

AMERICAN INSTITUTE OF COMPUTER SCIENCES

The leading edge of learning

America's most popular, most complete, and most affordable solution for the mail order business—order entry/review, credit card processing with draft capture, UPS manifesting, profit analysis, accounting, telemarketing, list management. Clipper compiled, dBase III+ files. Single and Multi-user versions. Find out why more people buy MOM after comparing! Demo kit \$25 refundable deposit.

MailOrderManager™

Dydacomp Development Corporation
150 River Road, Suite N1, Dept. PCM
Montville, NJ 07045

1-800-858-DMOM
201 335 1256



CIRCLE 589 ON READER SERVICE CARD

Exec-Amort™ - Loan Amortizer +

Accurate Benchmark Used Worldwide!

Favorites of banks & attorneys

Over 6500 sold!

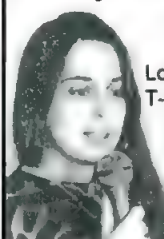
- ✓ Loan Amortization Reports
- ✓ 18 Digit Accuracy
- ✓ Creative Financing
- ✓ Instant Changes
- ✓ Fixed or Adjustable Interest Rates
- ✓ APR calc to US Reg. Z
- ✓ Bi-weekly & more
- ✓ Prepaid Interest
- ✓ Points, Fees, PMI
- ✓ Irregular Payments
- ✓ Balloon Payments
- ✓ Negative Amortization
- ✓ 360 or 365 or 360/365 day interest
- ✓ Solve for an Unknown
- ✓ Store loan to disk
- ✓ Report titles
- ✓ No Spreadsheet required
- ✓ Context help screens
- ✓ Menu Driven

Single User Price \$149.95
5 User Network Version Price: \$450.00
Order Today Call 800/858-8448
Fax Orders Call 313/791-3010
Phone (313) 791-0770

Electronics
36380 Garfield, Suite 1
Clinton Township, MI 48035 USA
Demo \$10, VISA, MC, AMEX, Discover
Ground Ship \$5, Air \$13, COD's add \$4 \$0
International add \$25

CIRCLE 592 ON READER SERVICE CARD

Computer Voice Control



Lookup
T-E-L-A

Telaccount,
664-2410

The Telaccount Speech Recognizer converts speech directly into key-strokes. Easy to use and accurate. Works with existing Windows 3.1 and DOS programs. Eliminates keyboard-mouse switching, increases productivity. Works with Sound Blaster, most other Windows-compatible sound boards. Voice lookup program included. Money-back guarantee.

Just \$69 Call 215-664-2410

TELACCOUNT INC.
421 Anthwyn Road, Narberth PA 19072

CIRCLE 595 ON READER SERVICE CARD

SERVICE BUREAU OUTPUT

35mm Color Slides
Color Overheads
Canon® Color Prints
Dye Sublimation Prints
4 x 5 Transparencies
Color Scanning
Video Output

NEXT DAY DELIVERY

IMAGE CENTER

703/343-8243 • Fax: 703/343-0691

800/433-8829

CIRCLE 596 ON READER SERVICE CARD

Slide Imagers
Overnight
\$4.95
Quality Guaranteed

Digital Output from files
We Offer Slides, Overheads, Hi-Res Neg/Pos 4x5's, 3MRainbow DyeSub, Canon Flery Laser, Kodak PhotoCD output, Scanning Services, & Large Slide Dupe Runs. Free Technical Support / Most Software Packages.

12-hour service standard. Modern to us your native files by 8 a.m. E.S.T. or send by Priority Air Express, and we'll have the finished product back to you by the next morning. CALL US TODAY!

The BEST Product, Service, Technical Support, and Price!
(800)232-5411
(404)873-5353
22-7th St • Atlanta, GA 30308

CIRCLE 597 ON READER SERVICE CARD

MUSICIANS ONLY!

D

No OUTSTANDING DUES.
FREE CATALOG.
CALL US AT 800-333-4554
(9-5 Pacific Time)

Soundware

100 Maple Center Dr.
P.O. Box 14
415-528-1234 FAX 415-528-0611

CIRCLE 598 ON READER SERVICE CARD

A chain is as strong as its weakest link.

Picture your Hardlock™ key as a bike lock, and the accompanying software routines used to implement the copy protection as the chain. You can own the best lock that money can buy, but that lock is useless if the chain is weak.

Introducing **HL-Crypt**, a major breakthrough in copy protection. HL-Crypt is not just a shell or simple conditional response checker. Using our proprietary Patcher Technology, HL-Crypt encrypts and binds the application to your Hardlock™ device. HL-Crypt features many protection modules that secure the application against piracy, reverse engineering, and debugging, to name a few.

Picture HL-Crypt as an ironclad chain. The only ironclad chain in the industry today.
For more information, call
1-800-562-2543

HL-Crypt

The Fortified Protection Linker for Hardlock

GLENCO ENGINEERING INC.
SERVING THE SOFTWARE INDUSTRY SINCE 1979
270 Lexington Drive
Buffalo Grove, IL 60089-6930
Phone 708/808-0300
Fax 708/808-0313
See us at Spring Computer South #W5755
Contact us for the name of the distributor in your country.

The only product that combines fortified software encryption with the Hardlock™ family of copy protection devices for single user and network implementation.
Made in the U.S.A.

GLENCO
Buffalo Grove, IL, U.S.A.
Printer

CIRCLE 600 ON READER SERVICE CARD

Key-Lok™ Security

- ☐ Fighting piracy since 1982.
- ☐ Algorithmic response
- ☐ Programmable memory
- ☐ Very economical
- ☐ Device transparent to PARALLEL/SERIAL port
- ☐ Multiple security layers
- ☐ Counters/Real-time clock
- ☐ Multiproduct licensing
- ☐ DOS/UNIX/VMS/etc

.....
Access Control System
.....
Diskette Drive Locks

Microcomputer Applications
3167 E. Otero Circle
Littleton, CO 80122
(303) 770-1917

CIRCLE 599 ON READER SERVICE CARD

PROTECT YOUR SOFTWARE TODAY

EVERLOCK 3.0

Software Solution

- ☒ OPTION BOARD SAFE
- ☒ CPU LOCK
- ☒ REMOTE REGISTRATION
- ☒ CD ROM LOCK
- ☒ WINDOWS COMPATIBLE

with over 14 new features you have asked for over the years. If Software based protection is what you need, don't settle for anything less than **EVERLOCK 3.0**.

Az-Tech Software, Inc.
LEADERS IN SOFTWARE SECURITY
201 East Franklin, Suite 11 Richmond, MO 64085
(816) 776-2700 FAX (816) 776-8398

EVERKEY LOCKS & BUTTONS

Hardware Solution

We have combined the Versatility of Az-Tech Software and the **ONE WIRE** Hardware Compatibility of Dallas Semiconductor in the new **BUTTON** package. With its **PRICE** advantage and added Flexibility, **EVERKEY BUTTONS** will lead us into a **dongleless** world.

As your partner in the fight against Software Pirates, Az-Tech is the only company that offers you these options in both a Software and a Hardware Solution:

***DATE & EXECUTION LIMITS* COMPRESSION
ENCRYPTION SERIALIZATION* REMOTE RESET**

These systems are easy to use and most importantly, they work! No other company can provide you the Compatibility, Flexibility, Ease of Use and Degree of Protection that you receive with all Az-Tech products.

Call Today For A Free Demo
1-800-227-0644

CIRCLE 601 ON READER SERVICE CARD

FREE CATALOG

Call
Toll Free

1-800-447-2181

PC SHAREWARE

ASP Member

619-272-6673

1763 Garnet Ave. • San Diego, CA 92109

CIRCLE 602 ON READER SERVICE CARD

PC Magazine's New
Classified Format puts your
ad in front of 1,000,000
buyers of computer products
and services at now,
surprisingly affordable
cost-per-inch rates.



Call your account
representative today at:

1-800-
825-4237

Ontrack

DATA RECOVERY



- PROFESSIONAL SERVICE - AUTHORIZED by Conner, Seagate, Quantum, Maxtor, Apple, Rodime, Western Digital, and Micropolis
- EXPERTISE in virtually every operating system and media storage device - including tape backups!
- 24-HOUR SUPPORT with weekend, priority, and on-site service available
- FOR FAST, SUCCESSFUL RESULTS call Ontrack, we can recover your data!

MN: 1-800-872-2599 • CA: 1-800-752-7557

U.K: 0800-24 39 96 • 44-81-974 5522

2400 Main Street, Suite 200, Irvine, CA 92714 • 6321 Burs Drive, Eden Prairie, MN 55346

REMOVE HARDWARE LOCKS

Maintain
Productivity!

Software utility that
allows for the removal
of hardware locks
Easy-Simple-Guaranteed

These and others
are available:

MaxRoute	\$250.00
Pads PCB	\$99.00
CadKey	\$99.00
MasterCam	\$250.00
Tango PCB II	\$99.00
MicroStation	\$99.00
PCAD	\$250.00

Visa and Mastercard
Welcome
Call or Fax for
more information

SafeSoft Systems Inc.
201-1111 MUNROE AVE.
WINNIPEG, MB
CANADA R2K 3Z5

PH (204) 669-4639
FAX (204) 668-3566

CIRCLE 603 ON READER SERVICE CARD

DATA CONVERSION

DISKS • TAPES • CARTRIDGES

CONVERSION-DUPLICATION-SCANNING

MORE FORMATS THAN ANYONE!

Quick • Reliable • Quality

WORD PROCESSORS, MINIS
MICROS, SPREADSHEETS
DATABASES, MAIL LISTS
IBM, DEC, APPLE, WANG
HP, WordPerfect, MS-Word



Lotus Dbase MICOM
LANIER CPT, NBI
DISPLAYWRITER

8/4MM, XEROX, CP/M, UNIX ...

NATIONAL DATA CONVERSION

5 East 16th Street, New York, NY 10003

(212) 463-7511

AMERICA'S LEADERS IN DATA CONVERSION

CIRCLE 605 ON READER SERVICE CARD

SOFTWARE DUPLICATION

- Highest Quality Media
- Competitive Pricing
- 24 Hour Turnaround
- Total Quality Assurance
- Custom Labels & Packaging
- Excellent Service

We Also Sell & Service
Duplication Equipment

**PRINCETON
DISKETTE**

800 426-0247

1101 RICHMOND AVE. • PT. PLEASANT BCH, NJ 08742

CIRCLE 606 ON READER SERVICE CARD

SOFTWARE DUPLICATION



Disks & Tapes
Package Design
Package Assembly
Printing
Fullfillment
Inbound Tele-Sales



EQUIPMENT

Disk Duplicators
Labeler Printers
Sleevers
Leasing
Maintenance



**VENTUNO
Distributor**

MEGAsoft

(800) 222-0490

FAX: (908) 462-5658

819 Highway 33 E.
Freehold, NJ 07728

CIRCLE 608 ON READER SERVICE CARD

DATA CONVERSION

If you want
the most
complete
conversion
services in the industry,
just call...



(800) CONVERT

Capabilities include over 3000 formats

**PIVAR
COMPUTING SERVICES, Inc.®**

165 Arlington Heights Rd. #M
Buffalo Grove, IL 60089

(708) 459-6810

CD-ROM MASTERING & DUPLICATION

ALL DISK FORMATS

9-Track Tapes

1/4" Cartridges

Quickest turnaround

Quality Media

Lowest prices

Virus scanning

Copy Protection

Fulfillment

Custom Printed Labels & Sleeves

For more 'Dupe Talk' call

**COMPANY
COMPENDIA, INC.**

Ph: 312-419-8771
Fax: 312-419-1390

1-800-374-DISK

CIRCLE 607 ON READER SERVICE CARD

DUPLICATION FROM \$.49

HIGHEST QUALITY MEDIA

MS DOS duplication from **\$.49** (5 25") and **\$.80** (3 1/2"). Prices go even lower as you continue to order!

- Duplication + 100% Verification
- Custom Labels/Sleeves Mailers
- Custom Packaging & Assembly
- Colored Media Available
- Special Rates For Demo Software & Site Licensing
- Educational Discounts Available
- 24 Hour Turn-Around
- Guaranteed Products

800-255-3142

Diversified Systems Group, Inc.
PO Box 1114, Issaquah WA 98027

CIRCLE 609 ON READER SERVICE CARD

DUPLICATE ANY FORMAT

- 5 1/4" and 3 1/2" Diskettes
- Fast and Versatile
- Easy to Use
- Stand-Alone or PC Based



Victory Enterprises
223 West Anderson Ln.
Suite B-300
Austin, Tx 78752
(512) 450-0801
Fax (512) 450-0869



800-727-DISK
(13475)

CIRCLE 610 ON READER SERVICE CARD

GLOBAL

11 Harbor Park Dr. Dept PCM1
Port Washington, NY 11050

FREE GLOBAL CATALOG

196 page guide to
computer furniture,
supplies and accessories

DIAL Toll-Free
1-800-8-GLOBAL

CIRCLE 611 ON READER SERVICE CARD

FORMATTED DISKETTES

5 1/4" 360K	35 ¢	3 1/2" 720K	55 ¢
5 1/4" 1.2mg	46 ¢	3 1/2" 1.4mg	87 ¢

BULK TAPES

2000	\$12.60	2120	\$16.00
6150	\$17.60	6320	\$22.50
4mm 1.3Gb ...	\$13.00	8mm 2.3Gb ...	\$12.80

SONY ♦ VERBATIM ♦ BASF

Price per disk in lots of 300

Subtract \$.04 for unformatted DD. Subtract \$.09 for unformatted HD.
Tapes in lots of 10. Mix and match any format or size.



MEGAsoft



(800) 222-0490

FAX (908) 462-5658 • 819 Hwy 33E • Freehold, NJ 07728

CIRCLE 612 ON READER SERVICE CARD

All Suppliers Were Not Created Equal

Call Media Source
For Real Value & Service.

GENERIC DISKS 100% Guaranteed

Qty./100	Qty./100
5.25 DS/DD .19¢	3.5 DS/DD .33¢
5.25 HD .29¢	3.5 HD .51¢

BULK O.E.M. Duplication Grade

Qty./100	Qty./100
5.25 DS/DD .23¢	3.5 DS/DD .45¢
5.25 HD .30¢	3.5 HD .68¢

NAME BRAND BULK

VERBATIM Qty.100	SONY Qty.100
5.25 DS/DD .29¢	3.5 DS/DD .58¢
5.25 HD .46¢	3.5 HD \$1.03

media source SINCE 1986
800-356-2553
FAX (404) 919-9228

All 5 25 Include Sleeves

CIRCLE 613 ON READER SERVICE CARD

BULK DISKS

SONY ♦ DYSAN ♦ VERBATIM

QTY 250

	BLANK	FORMATTED
5 1/4" DS/DD	.33	.39
5 1/4" DS/HD	.42	.54
3 1/2" DS/DD	.53	.68
3 1/2" DS/HD	.86	1.05

5 1/4" INCLUDE SLEEVES/24 HOUR SHIPPING

800-426-0247

We also sell and service
duplication equipment and
disk duplication services.

**PRINCETON
DISKETTE**

1101 Richmond Ave., Ft. Pleasant Bch., NJ 08742

CIRCLE 615 ON READER SERVICE CARD

TONER CARTRIDGES REMANUFACTURED

PRICES FROM

\$45

SHIP INCL.



Send empty with wand

TESTED - GUARANTEED - 24-HR TURN
HP, Apple, Canon, IBM, etc. Laser Cartridges
Canon/Sharp/ZKXerox Drum Copier Cartridges

NICER Toner, Fonts, Software for Laser Check Printing
Color Toner for Canon and IBM copiers
OPC Cartridges and Toner for almost all laser printers

1-800-239-4027

1-800-722-2804 (Atlanta)

ADVANTAGE
LASER PRODUCTS, INC.

1929 Queen City Ave. Tuscaloosa, AL 35401
2030 Powers Ferry Rd STE 218 Atlanta, GA 30339

CIRCLE 614 ON READER SERVICE CARD

FORMATTED DISKETTES BASF, VERBATIM, SONY

WITH FORMAT	QTY 250 MIX & MATCH	WITHOUT FORMAT
\$1.38	5.25" DS/DD	\$1.33
\$1.52	5.25" DS/HD	\$1.42
\$1.59	3.50" DS/DD	\$1.49
\$1.89	3.50" DS/HD	\$1.79

- FREE FORMATTING on first order
- TYVEC SLEEVES & Labels Included
- COLORED MEDIA Please Add \$.05
- VOLUME DISCOUNTS Available
- SAME DAY Shipping
- MONEY BACK GUARANTEE

800-255-3142

Diversified Systems Group, Inc.
PO Box 1114, Issaquah, WA 98027

CIRCLE 616 ON READER SERVICE CARD

It's A Jungle Out There!

*But PC Magazine
Classified Delivers
The Lion's Share
of the Market.*

PC Magazine
makes selling
easier by
delivering
responsive
direct buyers
twice monthly.

PC Magazine ads
trigger immediate
response and
direct sales.

*After reading an ad
in PC Magazine...*

- 60% of PC Magazine subscribers buy direct
- 55% of PC Magazine subscribers write/phone company for product information
- 47% of PC Magazine subscribers recommend the product to someone else

*With response like
this, your business
will do more than
just survive!*

Call your
PC Magazine Marketplace
account representative
today at:

**1-800-
825-4237**

THE NIGHT EXCHANGE FREE ACCESS

Never a charge! Never a charge!

Dial into America's newest
and largest FREE BBS.

62 lines!
Major BBS V6.0
Full color, Z modem transfers,
CD Rom

Live 1 to 1 or group chat, up
to 62 simultaneous callers

Exciting live multi-user
games, 50+ message forms,
more upon request!

Make your modem smoke!
Call Now!

1-715-758-1000

San Francisco's Premier Adult Gay Men's Online Service has NOW gone Nationwide!

- ♥ Local access from over 1,000 US cities!
- ♥ Live uncensored group & private chat!
- ♥ Online, interactive, multi-player games!
- ♥ Lively salon style public forums!
- ♥ Over 20,000 Adult rated GIFS & files!
- ♥ MatchMaker online databases!
- ♥ 50+ lines available 24 hours a day!
- ♥ Gay owned and operated, your privacy assured!
- ♥ **Much, much more!**

For your local access number,
information, & signup, CALL:

(415) 703-8200

Set modem to 8/N/1. You must be 18 or older.
Finally...a national adult Gay men's BBS!

EYE CONTACT

Body Cello

Adults Only Must be 18 or older to order

Floppy Disk 25 color pictures, image viewer free w/1st order. \$888

2-1-1 Sampler (Adults Only) \$29.95
2-1-1 Erotic Underwear \$29.95
2-1-1 Erotic Calendar \$29.95

CD-ROM 200 images in 24-bit color. Picture viewer.

2-1-1 Scandalous pictures \$199.95
2-1-1 VirtualROM (Adults Only) \$199.95
2-1-1 Heavenly Bodies V2 - pictures \$199.95

Color Catalog FREE color uncensored catalog w/purchase

Or send \$5.00 for your catalog to: **Body Cello**
P.O. Box 1051, San Francisco, CA 94109

Dealer Inquiries: **1-800-922-3556**
Welcome. FAX: (415) 758-2307 • Include \$4.75
shipping • Free catalog \$5.00 • Adults only service

CIRCLE 622 ON READER SERVICE CARD

Where Adults Come To Play!

ODYSSEY

**Discover The BBS That
America Is Talking About!**

- A Local Call From 800 Cities Worldwide!
- CHAT Live With Thousands of Users in Groups and Private!
- Live Tournament Gaming!
- Giant Message Exchanges!
- Thousands of Shareware & GIF Files!
- Online Shopping/Travel/Reservations!
- Matchmaker With "DATING-BASE"!
- Special Women's Groups!
- Plus Much Much More!

For Modem Signup or More Info Call

818-358-6968

Must Be Over 18 (BN).

CIRCLE 624 ON READER SERVICE CARD

EROS

COMES ALIVE ON
YOUR PC OR MAC!

Experience EROSLink™
The Ultimate Online Service

- ☐ Uninhibited one-on-one chat and party lines with our exciting hostesses and other callers.
- ☐ Sensuous color, publication-quality images for downloading.

Act Today! Get your software
and information on how to
access EROSLink in your
area—

Use your modem (8-N-1) to dial:

1-212-254-0969

When asked for ID, enter: EROS.
(Must be over 18 years of age)

CIRCLE 620 ON READER SERVICE CARD

FOR ADULTS ONLY

You must be over 21 to
access

LIFESTYLE

Meet sexy singles/couples
on the world's hottest adult
chat system - Lifestyle BBS.
Less than .30c per hour.
Log on: 516-689-5390

AND

GRAFIX

Computer pictures so hot
they could melt your modem.
Log on: 516-689-2853

SUPER CHEAP • 100% PRIVATE
Local access from 500+ cities

CIRCLE 621 ON READER SERVICE CARD

ECSTACY

HOT PICS VOL. 1

\$99

**#1 SELLING ADULT
PREMIUM CD-ROM**

- ☐ Over 560 MB of Erotica Viewing Pleasure
 - ☐ Over 300 Animations
 - ☐ Over 470 Adult Stories
 - ☐ 2600 High Res. Pictures
- Fully BBS Ready

800-959-6042

Must state age 21
Other titles available
Dealers welcome

CIRCLE 623 ON READER SERVICE CARD

FREE!

Download the HOTTEST & SEXIEST images
from our ADULT On-Line Magazine - FREE!

LACE is an Adult On-Line Magazine that
offers you:

- ORIGINAL Adult GIF Images not available on any other BBS!
- GORGEOUS, Sexy & Exotic Models both Amateur and Professional!
- QUALITY Adult GIF Images and VGA Movies produced by professionals!
- HIGH SPEED access available on ALL lines (14.4k down to 1200 baud).

Set your Modem to 8-N-1 and dial:

(818) 709 - 4275

Questions? Call our voice line at (818) 709-3795.

LACE

the on-line adult magazine

Must be 18 Years of Age or Older • Limited Offer

CIRCLE 625 ON READER SERVICE CARD

PC Magazine subscribers spent an average of \$62,245 each on computer products
purchased direct in the past 12 months.

Did you get your share?



Get it! Call your PC Magazine Marketplace account representative today at

800-825-4237

Source: Purchasing of Products through the Direct Channel, 1992.

PC Magazine's BusinessCard section is a forum for innovative, hard-to-find and low-cost PC products and services. Ads are listed by product category and include Reader Service numbers to allow fast, easy response.

RATES:

1 issue—\$715, 3 issues—\$625, 6 issues—\$605,
12 issues—\$570, 17 issues—\$545, 22 issues—\$535.
Multiple-ad per issue rates also available. Prepayment must accompany each insertion. VISA/MC welcomed.

AD FORMAT:

PC Magazine will design and typeset each BusinessCard ad. Advertisers should furnish typewritten copy. Ads include: 1) Headline (1 line, initial caps=30 characters max., all caps=25 characters max), 2) Descriptive copy (5 lines, 225 characters max), 3) Company name (same specifications as headline), and 4) Address and telephone number (2 lines, 40 characters per line). No logos, artwork or camera-ready ads. Publisher reserves the right to edit supplied copy to meet section specifications.

DEADLINES:

PC Magazine is published 22 times a year, (monthly except for July and August). The BusinessCard closing is approximately two months prior to issue date.

Please send copy and payment to:
PC Magazine BusinessCard
One Park Avenue, 3rd Floor
New York, NY 10016

For more information, call 800-825-4237
or 212-503-5115, FAX: 212-503-5860.

HARDWARE BATTERIES

COMPUTER BATTERIES

Nickel Cadmium, Lithium, Lead Acid & Alkaline Batteries for PC Boards, UPS, Printers & Laptop Computers. Custom Build Battery Packs. MC/V

EVS SUPPLY

1350 Arapaho #126, Richardson, TX 75081
1-800-776-5267 FAX 214-231-2269

CIRCLE 701 ON READER SERVICE CARD

CD-ROM

AFFORDABLE CD-ROM TITLES

- Masterpiece Library: 1,300 classic books w/index & search tools. \$39.95! (+S&H)
- Educational Gameland • Women of Venus
- GIFs Galore • SONY CADDIES \$4.95 (+S&H)
- Many More Titles! • M/C, Visa, Amex.

PACIFIC HITECH, INC.

4760 Highland Dr., Ste 204, SLC, UT 84117
Tel: (800) 765-8369 Fax: (801) 278-2666

CIRCLE 702 ON READER SERVICE CARD

100's of CD-ROM Titles Available

- Shareware Studio II..\$59-#1 Rated Public Domain CD, Over 7000 Programs. Windows, Games, etc.
- Sound Sensation..\$29-Audio & Animation Files;
- Adlib & SB Compatible • WindowWare..\$39•Moving Fantasies..\$99 •Extreme..\$79•Ecstasy..\$99

Data Rom Express

P.O. Box 9 Warrington, PA 18931
MasterCard/Visa Orders Call 1-800-243-6460

CIRCLE 703 ON READER SERVICE CARD

ALL ORIGINAL ADULT CD ROM

- All original photography
- Featuring San Diego's finest amateur models
- Fully licensed for BBS / Sysop use
- Almost 1000 SVGA adult images
- 100% Free of Copyright hassles!

GIFFY ENTERPRISES

9528 Miramar Rd. Ste. 277, San Diego, CA 92126
800-GIFFY69/619-624-0375/FAX:619-528-1080

CIRCLE 704 ON READER SERVICE CARD

WORLD VISION 3-CD SET

An amazing 3 gigabyte collection of 20,000 shareware programs for only \$99! If you want quantity and quality at its best you'll find it with WORLD VISION! DEALERS CALL: 609-875-8542

WORLD VISION

P.O. BOX 89, ERIE, PA 16512
1-800-424-0234 FAX:609-875-6630

CIRCLE 705 ON READER SERVICE CARD

COMMUNICATIONS/NETWORKING

KEYBOARD, VIDEO, MOUSE

EXTENSION with EXTENDER
SPLITTING with COMPANION
SWITCHING with COMMANDER
Boosts SIGNALS UP to 600 FT. Control Up to 96PC's with one KEYBOARD and MONITOR.

CYBEX CORPORATION

2800H Bob Wallace Ave., Huntsville, AL 35805
PHONE 205-534-0011 FAX 205-534-0010

CIRCLE 706 ON READER SERVICE CARD

LAN Problems Diagnosed - Fast!

We have the skill, experience and tools (NGC Sniffers, WG, Protocols +) to diagnose any problem - Cabling, Routing or Application. Ethernet, Token Ring, FDDI, TCP/IP, Novell, Apple, DEC, Dialup available - we can download analyzer to your PC!

Pine Mountain Group

For Nationwide Service & Analysis Training
Tel: 800-645-8486 FAX 209-962-5914

CIRCLE 707 ON READER SERVICE CARD

COMPUTER SYSTEMS

WHOLESALE 486 PRICING

486SX-25:\$1269, 486DX-33:\$1449, 486DX2-50:\$1569, 486DX-50:\$1599, 486DX2-66:\$1729
4MB RAM, 1.2 & 1.44FD, 170MB HD, SVGA .28, KB101, SVGA w/1M, 251PIG, Mouse 1 Yr. Wnty. OPT CD ROM \$195. VESA LOCAL BUS AVAILABLE

ONE STEP AHEAD SYSTEMS

P.O. Box 832482, Richardson, TX 75080
Tel:(800) 886-0808 FAX (214) 234-3478

CIRCLE 708 ON READER SERVICE CARD

DISK DRIVES

INCREDIBLE HARD DRIVE PRICES!!

MAXTOR 130MEG, 15MS, 1 yr warranty \$199
MAXTOR 213MEG, 15MS, 1 yr warranty \$282
Western Digital, 250 MEG, 12MS, 3 yr wnty \$305
Western Digital, 340 MEG, 12MS, 3 yr wnty \$430
CALL FOR CURRENT PRICES! LOWEST Guaranteed!

MRC HARD DRIVE WAREHOUSE

815 W. 4th St., #201, Joplin, MO 64801-2980
Tel: 800-743-9665 FAX: 417-781-9308

CIRCLE 709 ON READER SERVICE CARD

LAPTOP/PORTABLES

PORTABLE COMPUTER BATTERIES

Replacement batteries for over 150 portable computer makes and models. No computer too old or new. In stock, immediate shipment. Credit cards accepted. FREE CATALOGUE.

Penguin Portables

CALL 800-241-1096

CIRCLE 710 ON READER SERVICE CARD

PERIPHERALS

??? RADIOACTIVE ???

Plot it on PC with RM-60 Rad. Monitor+Alarm. Serial or LPT port. Alpha-Beta-Gamma-Xray. RADON + Sources •+Windows+MicroR:1000X survey geigers Background+Food+Clouds. TSR, GM tube, PC Mag & Byte rev. V/MC+\$149.50+45 day \$back.

AWARE ELECTRONICS CORP.

P.O. Box 4299, Wilmington, DE 19807
(800)729-5397 Phone or Fax: (302)655-3800

SOFTWARE BUSINESS

RESURRECT AGENDA!!

President's Planner is a Newton-like, AI-based expert system that uses Agenda's resources to finally deliver on the original promise. "If you do use Agenda, you'll want President Planner...a big Chaos Manor Orchid" J. Pournelle, BYTE April 1993

Phase III Computing Inc.

88 Bloor St., E., Ste.3009, Toronto,Ont. M4W 3G9
Tel:800-388-9728/416-925-8760/Fax:920-9242

CIRCLE 712 ON READER SERVICE CARD

Quicken® and Peachtree® Users

BlankCheck allows you to use 1 blank form and print checks for up to 300 checking accounts on your HP laser printer using your software and our BlankCheck kit. Complete kit including software, MICR toner and forms only \$799.

Magnetic Software

800/628-MICR (6427) Canada 416/288-1266
919/786-1336 Australia 02/553-8933

CIRCLE 713 ON READER SERVICE CARD

"JOB SECURITY FOR THE 90's"

Personal FocusNet SW Package •Increase interview rate by 300% •Access National Workorder Network •Build electronic profiles of skills, etc. •Generate strategically focused resumes. Order Now! \$149 - M/C, VI, CK/MO. Regional Managers Wanted.

World Knowledge Corporation

Dept. 301, 15098 Golden Star Ave., Riverside, CA 92506 Tel: 909-780-2488 Fax:909-780-2795

CIRCLE 714 ON READER SERVICE CARD

CAD/CAM

Parametric Surface Modeler

— MultiSurf —
Object oriented, PC-based. Complex models with accurate surface-surface joins. 16 surface types, including lofted, developable, blended, foil, NURBS, 2-D and 3-D DXF output. \$1,975.

AeroHydro, Inc.

PO Box 684, Southwest Harbor, ME 04679 USA
Tel: 207-244-7347 FAX: 207-244-7249

CIRCLE 715 ON READER SERVICE CARD



READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions.

2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about.

3. The literature will be mailed to you from the advertiser free of charge.

Valid after October 31, 1993

CIRCLE FOR FREE INFORMATION

001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047	048	049	050
051	052	053	054	055	056	057	058	059	060	061	062	063	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079	080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095	096	097	098	099	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850
851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950
951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000

1. Do you work in a DP/MIS dept.?
01 ☐ Yes 02 ☐ No

2. Please indicate your company's or organization's primary business activity. (Check one only.)

01. ☐ Manufacturer Computer Equip., Computers, Software
02. ☐ Manufacturer—Aerospace
03. ☐ Manufacturer—Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government—Federal
11. ☐ Government—Non-Federal
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture

16. ☐ Agriculture/Construction/Mining/Oil/Transportation/Utilities17. ☐ Non-Computer Retailer/Distributor
18. ☐ Other Business or Service

3. Please indicate your primary business function: (Check one only.)

01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.
99. ☐ Other

4. Is your company a reseller?
01 ☐ Yes 02 ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products:

01. ☐ 10 or less 03. ☐ 26-99
02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office? (Check all that apply.)

01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply.)

01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh
05. ☐ CD-ROM
06. ☐ Windows

8. Do you plan to buy any PC products?

01. ☐ Now 03. ☐ In 7 to 12 months
02. ☐ In 4 to 6 months 04. ☐ No definite plans

9. Number of Employees in your entire company:

- 01 ☐ 25 or less 02 ☐ 26-99 03 ☐ 100-499 04 ☐ 500-999 05 ☐ 1000 or more

PLEASE PRINT CLEARLY

PC 6/15-6

Name

Title

Telephone

Company Name

Address

City

State

Zip

☐ Please send me one year (22 issues) of PC Magazine for \$29.97. Offer valid in U.S. only.

Free Product Information

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE

P.O. Box 1687
RIVERTON, NJ 08077-9687NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

Free Product Information

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. Box 1687
RIVERTON, NJ 08077-9687

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions.

2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about

3. The literature will be mailed to you from the advertiser free of charge.

CIRCLE FOR FREE INFORMATION

Void after October 31, 1993

001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047	048	049	050
051	052	053	054	055	056	057	058	059	060	061	062	063	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079	080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095	096	097	098	099	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850
851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950
951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000

1. Do you work in a DP/MIS dept.?
01. ☐ Yes 02. ☐ No

2. Please indicate your company's or organization's primary business activity. (Check one only)

01. ☐ Manufacturer Computer Equip., Computers, Software
02. ☐ Manufacturer-Aerospace
03. ☐ Manufacturer-Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government-Federal
11. ☐ Government-Non-Federal
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture

16. ☐ Agriculture/Construction/Mining/Oil/Transportation/Utilities

17. ☐ Non-Computer Retailer/Distributor
18. ☐ Other Business or Service

3. Please indicate your primary business function. (Check one only)

01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.
99. ☐ Other

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products?

01. ☐ 10 or less 03. ☐ 26-99
02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office? (Check all that apply)

01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location. (Check all that apply)

01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh
05. ☐ CD-ROM
06. ☐ Windows

8. Do you plan to buy any PC products?

01. ☐ Now 03. ☐ In 7 to 12 months
02. ☐ In 4 to 6 months 04. ☐ No definite plans

9. Number of Employees in your entire company:

01. ☐ 25 or less 02. ☐ 26-99 03. ☐ 100-499 04. ☐ 500-999 05. ☐ 1000 or more

PLEASE PRINT CLEARLY

Name

Title

Telephone

Company Name

Address

City

State

Zip

☐ Please send me one year (22 issues) of PC Magazine for \$29.97. Offer valid in U.S. only.

PC 6/15-6

CD-ROM

"SOFTWAREVAULT COLLECTION 2"

EXCEPTIONAL NEW RELEASE, highly acclaimed user interface! 600+ Megs, 10,000+ files, enhanced menu, 90% '93 programs - Hottest Hits of Spring '93, Windows, GIF's, Soundblaster, Midi, games, and much, much, more for only \$49.95.

AMERICAN DATABANKERS

1820 S MAIN ST., BROKEN ARROW, OK 74012
1-800-775-4232

CIRCLE 716 ON READER SERVICE CARD

COMMUNICATIONS/NETWORKING

PC-SENTRY PROTECTS YOU!

Detect unauthorized use & copying. Monitor & log file access, productivity, "after hours" use. Time & billing. Enforce company policies. Single PC (\$99) or Network (\$329) versions. Works w/DOS, Windows & all major networks. V/MC/COD appr. PO.

Solid Oak Software

P.O. Box 6826, Santa Barbara, CA 93160
1-800-388-2761 FAX: 805-967-1614

CIRCLE 717 ON READER SERVICE CARD

CONSTRUCTION

SERVICE MANAGEMENT SOFTWARE

Instant access to customer history. Automated dispatching. Timely billing. Take charge of your business with CMAS Plus, our integrated accounting/job costing/service management system for specialty contractors. Call for free demo.

DATA-BASICS, INC.

11000 Cedar Road • Cleveland, OH 44106
1-800-837-7574 • Fax (216) 721-2398

CIRCLE 718 ON READER SERVICE CARD

DATA BASE

dBASE file access from C, Pascal,...

CodeBase 5.0 gives complete database management with multi-user dBASE, FoxPro or Clipper file compatibility from C, C++, Pascal or Basic. Full 90 day money back guarantee. Order now for a FREE CodeReporter or call now for a FREE demo.

SEQUITER SOFTWARE

#209, 9644-54 Ave, Edmonton, AB, Can. T6E 5V1
Call (403) 437-2410, Fax (403) 436-2999

CIRCLE 719 ON READER SERVICE CARD

PROFESSIONAL PROGRAMMERS!

AccSys libraries offer access to dBASE and Paradox files. Network ready. Multi-platformed. Develop applications for DOS, DOS Extenders, OS/2, Windows (DLL). Popular compilers supported. Demo Call 708-924-3030. Request 889835

COPIA INTERNATIONAL LTD.

1342 Avalon Ct., Wheaton, IL 60187
708-682-8898 FAX: 708-665-9841

DATA ENTRY

VIKING DATA ENTRY SYSTEM

- Software for Data Entry Professionals
- Advanced Validations & Re-key Verify
- Used by U.S. Census & 26 of Fortune 50
- MS/DOS, UNIX, VMS, AIX Versions
- Free Preview Demo

Viking Software Services, Inc.

4808 E. 67th St., Tulsa, OK 74136
(800) 324-0595 FAX: (918) 494-2701

The Data Entry Emulator™

Full featured, heads-down data entry with two-pass verification, edit language, operator stats, batch control, output record reformat, on-line help, free tech support. From \$395. LAN version available.

Computer Keys

21929 Makah Road, Woodway, WA 98020
800-356-0203/206-776-6443/Fax:206-776-7210

DATA MANAGEMENT

OMR Software Breakthrough

Save time & money. Create your own OMR scannable forms on the fly using Word-Perfect®5.1. Scanning technology breakthrough links w/existing database or other applications. Offers many data collection features! Easy to use.

Scanning Concepts, Inc.

2225 West 4th Street, Duluth, MN 55806
Phone(800) 362-3282 Fax:(218) 722-9380

CIRCLE 723 ON READER SERVICE CARD

EDUCATION

1 DAY ON-SITE C++ SEMINAR

An outstanding presentation and excellent courseware make this one of the best C++ training seminars available. Train an entire staff at your location in only one day. Custom training and consulting also available.

HEBBEL CONSULTING, INC.

PO Box 41624, St. Petersburg, FL 33743
Telephone: (813) 398-6099

CIRCLE 724 ON READER SERVICE CARD

DERIVE®, A Mathematical Assistant

New version 2.55 combines power of computer algebra with 2 & 3D plotting & menu-driven interface. Does symbolic & numeric equations, calculus, trig, vector & matrix algebra & more. Req:MS DOS computer, 1 floppy disk drive & 512K. \$250.

Soft Warehouse, Inc.

3660 Waiialae Avenue, Suite 304
Honolulu, HI 96816-3236 (808) 734-5801

CIRCLE 725 ON READER SERVICE CARD

FREE REPORT ON VIRUSES!

"Outlook on Computer Viruses for 1993" by the world's only professional virus writer tells the truth you won't hear elsewhere! Circle RS Number for free copy of this shocking report and a catalog of interesting virus products!

American Eagle Publications, Inc.

P.O. Box 41401, Tucson, AZ 85717
(602) 888-4957

CIRCLE 726 ON READER SERVICE CARD

ENGINEERING

SIMULATION

GPSS/PC™ is full-power version of the most popular mainframe simulation language, GPSS. Designed for interactive use on high-speed microprocessors, it has 6 graphics and animation windows. It predicts behavior of complex systems.

MINUTEMAN SOFTWARE

P.O. Box 171/B, Stow, MA 01775
800-223-1430/508-897-5662 Ext.316

CIRCLE 727 ON READER SERVICE CARD

ENTERTAINMENT/GAMES

PLAY LOTTO TO WIN!

Thousands of winners have used statistical analysis and wheels. Windows Lotto does all the work for you. Includes drawing history, wheels, charts and much more! Easy to use. Windows 3.0 3.1. Only \$45.95. MO/CHK/MC/VISA.

DATA SOLUTIONS

1529 Thistledown Dr., Brandon, FL 33510
1-800-783-8934 Fax: 813-653-3093

CIRCLE 728 ON READER SERVICE CARD

ADULT VGA SOFTWARE

Stop Paying High Prices for Adult Software! We offer the Best in Adult VGA Software at Lowest Prices. Visa & MasterCard Accepted. Movies, Games, Pictures. WE NOW SELL CD-ROMS. (You must be 18 or older to order.)

CLEARLIGHT SOFTWARE

P.O. Box 1411, Milwaukee, WI 53201
(414) 962-2616

CIRCLE 729 ON READER SERVICE CARD

VIRTUAL REALITY

Unbelievable 3-D images on your color computer monitor. SHAREWARE disk \$9.95 includes 3-D Glasses. REGISTERED disk \$24.95 includes Bonus VR Program, VR Booklet & more. \$ Back Guar. Specify disk size, DOS or Win. VISA/MC CK/MO

3-D MAGIC

P.O. Box 1377, Alexander City, AL 35010
(205) 329-3767

CIRCLE 730 ON READER SERVICE CARD

LOTTO FOR WINDOWS

Lot-O-Win contains the complete drawing history for all US States and Canada. Lot-O-Win is a GUI tool for Windows 3.X and has many Charts, Statistics, Reports, Filters and Wheels. \$44.95 + \$5.00 S&H Florida add 6% S. Tax. MO/COD/CHK/MC/VISA.

JMH SOFTWARE, INC.

2892 Mandarin Place, Palm Harbor, FL 34684
1-800-835-0220 813-785-8361

CIRCLE 731 ON READER SERVICE CARD

FINANCIAL

CONTRACT COLLECTOR™

For banks, finance companies & private investors collecting installment payment loans, notes, contracts & mortgages. Handles escrows, reserve collections, adjustable rate & prime rate indexed loans. Includes complete G/L. Prints IRS forms.

COMTRONIC SYSTEMS, INC.

205 Harris Avenue, Cle Elum, WA 98922
Tel: (509) 674-7000 Fax: (509) 674-2383

CIRCLE 732 ON READER SERVICE CARD

FOREIGN LANGUAGES

French, Spanish, German, Russian

We stock a full line of top quality unidirectional and bidirectional PC translation software. English to French from \$69.95 (our own), English to Spanish from \$129.95. \$5 S&H, Visa/MC. Give us a call with your foreign language software needs.

Fluentsys Corporation

10451 Mill Run Circle, Suite 400
Owings Mills, MD 21117 (800) 243-4470

CIRCLE 733 ON READER SERVICE CARD

GENEALOGY

Family Roots™

Do it YOUR way! Huge variety & capacity for your family history. Make pedigree & descendants charts, person & group sheets, indices, histories, address labels, searches, more. Call for FREE info. Satisfaction gtd. PC or Mac. MC/V/Amex/Discover

QUINSEPT

Box 216, Lexington, MA 02173
800-637-7668 617-641-2930

CIRCLE 734 ON READER SERVICE CARD

MAILING PROGRAMS

Mail Order Manager™

America's most popular solution for mail & phone order businesses - order entry/review, credit card processing, UPS manifesting, profit analysis, acctg, telemkt'g, list mgmt. Clipper compiled/dBase III+ files. Single station & network versions. Demo kit.

Dydacomp Development Corp.

150 River Road, Ste N1 Dept.PCM, Montville, NJ 07045 Tel:800-858-DMOM or 201-335-1256

CIRCLE 740 ON READER SERVICE CARD

MANUFACTURING

Over 3,100 Satisfied Users!

Mfg. inventory control, multi-level BOMs, integrated purchasing costs \$1995. Optional scheduling module w/work orders, time-phased prod.scheduling, & MRP \$800. \$ back guarantee. Feature-rich demo prints 60+sample reports — Just \$5. V/MC/Amex

Microcomputer Specialists, Inc.

P.O. Box 795, Woodstock, VT 05091
Call toll-free 1-800-833-1500

CIRCLE 746 ON READER SERVICE CARD

GRAPHICS

INGRAF - Graphics Library

Multi-Device Graphics Library. Some of the devices supported are: SVGA, Epson, LaserJet, PaintJet, Postscript, HPGL, DM/PL. Available in C, FORTRAN, PASCAL and BASIC languages. Full source code and Library. NO ROYALTIES. \$350.00

Sutrasoft

10506 Permian Dr. • Sugar Land, TX 77478
TEL: (713) 491-2088 • FAX: (713) 240-6883

CIRCLE 735 ON READER SERVICE CARD

Make Ready for the Global Market!

"Global-Z" - the international Mail Management System for easy and accurate US/CAN and global mailings. Labels, envelopes, reports, mail-merge, import/export. Postal code data may be purchased separately. Call for Demo!

DASSGAR SYSTEMS, INC.

PO Box 915, Bennington, VT 05201
802-447-3978/718-539-5220/Fax:802-442-3473

CIRCLE 741 ON READER SERVICE CARD

pc/MRP ACCTING/MFG SOFTWARE

pc/MRP's 12 integrated modules include Inventory, BOM, Sales, Purchasing, Receiving Invoice, StkRoom, WorkOrder, Addr, GL,AP,AR Working Demo w manual \$35.00
Sm Single User \$179.00, Multi-user \$695.00

Software Arts

PO Box 3621 Santa Clara, CA 95051
PHONE 408-248-6445 FAX 408-248-6445

CIRCLE 747 ON READER SERVICE CARD

AccuSoft Image Format Library 3.0

TIFF,PCX,TARGA,GIF,DIB,BMP,DCX,EPS,WMF,WPG,P ICT,JPEG. Import, export, convert, display, and print! DOS & Windows versions in 1 package. No royalties. Compatibility guaranteed. Rotate, scale, color reduction, sharpen, etc. 30 day gtd. \$495

Accusoft Corporation

160 E. Main St., P.O. Box 1261, Westboro, MA
(800) 525-3577 508-898-2770 Fax:508-898-9662

CIRCLE 736 ON READER SERVICE CARD

Postage Savings From Your PC!

Specially designed for high volume mailers, PostWare products help you standardize, correct, & add postal codes to addresses; presort & palletize 1/2/3 Class mail; merge/purge & find duplicates; print barcoded labels; & more.

Postalsoft, Inc.

4439 Mormon Coulee Road, La Crosse, WI 54601-8231 Tel: (800) 831-MAIL (6245)

CIRCLE 742 ON READER SERVICE CARD

MAPPING

Geo Whiz Desktop Map & Database

\$129.95 gives you US maps. Overlay your data on maps with several options. • 360K miles of roads & Hwys • Variable zoom • Find lat/long coordinates • Import/export data • Print maps. Options: 5-digit zip database, Detailed county maps

KOSITZKY & ASSOCIATES, INC.

1601 Greenbriar Pl. Ste. J, Okc., OK 73159
PH: 405/692-1683 FAX: 405/692-1698

CIRCLE 748 ON READER SERVICE CARD

HEALTH/FITNESS

Nutrition & Fitness Software

The TOP-Rated Software. Lose weight! Plan workouts! Control fat, cholesterol, salt! Plan/analyze menus! GET RESULTS! Personal & professional software. 50+ functions, terrific reports, 2000-11,500 foods. From \$29 - \$995. FREE Demo Disk.

ESHA Research

POB 13028M, Salem, OR 97309-1028
503-585-6242 fax: 503-585-5543

CIRCLE 737 ON READER SERVICE CARD

SoftSpoken Mailer for Windows

Print USPS-certified barcode on ordinary mailing labels. Presort 1st/3rd Class for rates as low as 11.4 cents! Get ZIP+4 & forwarding addresses. De-dupe lists. Easy to use - Windows 3.0-3.1. \$295; 60-day \$-back guar. Call for free brochure!

Micro Computer Solutions Inc.

19225 Orbit Dr., Gaithersburg, MD 20879
Tel: (800) 536-1674 Fax: (301) 990-3155

CIRCLE 743 ON READER SERVICE CARD

PRACTICE BILLING

MD VersaForm, flexible, ledger based design, billing package. Programmable; customizable reports, files, & screens; includes database mgmt system & full source. ECS. LAN support. \$1,295 sgl user. Free lit & demo. Dirs wanted.

Applied Software Technology

591 W. Hamilton Ave., Ste 201, Dept. 99
Campbell, CA 95008 (800) 678-1111 Ext.99

CIRCLE 749 ON READER SERVICE CARD

MEDICAL

Hot New Windows Fitness Software!

Track, motivate, look / feel great with Bill Rodgers' WinTrainer™! Already #1 - recommended by top athletes. Fast, fun, easy - just point & shoot to log, graph, print, analyze. Pump up your aerobics, runs, cycling, more! No-risk 30-day trial. \$59.95 V/MC.

Personal Performance Software

3 Northern Boulevard, Amherst, NH 03031
Call today toll-free! 1-800-RUN-4-USA

CIRCLE 738 ON READER SERVICE CARD

MAINTENANCE MANAGEMENT

PC-based system for the small to medium size business. FEATURES: Work Orders (space for detail instructions & safe work procedures), equipment descriptions, historical data, operating & analytical reports, inventory. Write for free Demo!!

PENGUIN COMPUTER CONSULTANTS

P.O.Box 20485, San Jose, CA 95160
800-521-0545 (408)997-7703 Fax (408)927-0570

CIRCLE 744 ON READER SERVICE CARD

LYTEC MEDICAL

Advanced practice management for only \$199.00. According to PC World: "This program is packed but costs only a tenth of what its competitors charge...The key features are all here." Network and Windows versions also available.

Lytec Systems, Inc.

6975 Union Park Center, Suite 270
Midvale, UT 84047 Tel:1-800-735-1991

CIRCLE 750 ON READER SERVICE CARD

INVENTORY

INVENTORY MANAGEMENT

Stock-Master 4.0, com. grade system, has Stock Status Rptg, PO Write & Track, Trend Analysis, QC Rptg, Trans Hist Detail Analysis, Multi Loc support, BOM, Matl Req Planning, Serial/Lot No Track, Quote/Ord/Inv Prep.

Applied Micro Business Systems, Inc.

177F Riverside Ave., Newport Beach, CA 92663
714-759-0582

CIRCLE 739 ON READER SERVICE CARD

MAINTAIN! MANAGE! CONSERVE!

Equip, Assets, Vehicles, Bldgs, HVAC, Everything! Work Orders, Procedures, Resources, Inventory, Purch Orders, Energy, Utility Bills, Rate Anal. ALL in "C", w/Btrieve, DOS/Windows, Mouse. EST:1975! 45 day full prog for S/H cost \$10. Reps needed.

GENERAL ENERGY TECHNOLOGIES

250 E. 17th St., Costa Mesa, CA 92627
714-645-7733 Fax:714-645-7747

CIRCLE 745 ON READER SERVICE CARD

PRACTICE BILLING - Software

Nationwide use since 1979. ELECTRONIC CLAIMS. Full support. Simple Q/A. Full pt. ledgers, stmts, reports, everything. Tutorial. On-line help. LAN compatible. Physician designed. Single User: \$495+. Newsletter, FREE WORKING DEMO, virus free.

Physicians' Office Computer

1240 Kona Drive, Rancho Dominguez, CA 90220
800-782-5214

CIRCLE 751 ON READER SERVICE CARD

MEMBERSHIP

MEMBERSHIP MANAGEMENT

Clubs Associations Churches Synagogues More
Membership Attendance Billing Contributions.

FROM \$95 - FREE BROCHURE

LINKED SOFTWARE

78 Lake Frankston, Frankston, TX 75763
800-949-5465 903-876-2224

MICROSOFT C PROGRAMMERS

Copy protect your software programs with this copy protection software kit. Copy protection is done entirely in software on the diskettes you will be supplying your customers. Only \$45.00 pp. Send Check/MO for more information.

MYRON J. SEIBOLD

P.O. Box 6069, Long Beach, CA 90806

PROPERTY MANAGEMENT

Since 1978 over 7,500 users of our software have found it comprehensive, flexible & easy to use. We offer systems to manage: Commercial/Residential/Condominium/Homeowners/Assoc./Mini-Storage Facilities. For info. & prices call:

REALTY AUTOMATION

11365 East Shore Drive, Hayden Lake, ID 83835
(208) 772-3259

CIRCLE 764 ON READER SERVICE CARD

MUSIC

FRANK'S PIANO TUNING

With a PC and our program, tuning your piano is almost as easy as tuning a guitar. Demonstrations in arpeggios allow choices of tuning style. The brochure for only \$3.59 (stamps 29 cents X10 & 23 cents X3 accepted) and the program \$60.00

FRANK'S PIANO TUNING

9112 McDonald Drive, Bethesda, MD 20817
Tel: (301) 469-8661

CIRCLE 753 ON READER SERVICE CARD

PUBLIC DOMAIN/SHAREWARE

\$1.25 PER DISK SOFTWARE

Why spend big bucks on Software?
Check out all of the great Public Domain and Shareware software available for DOS and Windows
FREE CATALOG

BlzComp Services

P.O. Box 345
Moorpark, CA 93021

CIRCLE 759 ON READER SERVICE CARD

Property Management

Software for managing residential, commercial, condos, etc. Basic version for owner/manager- \$495, Deluxe for professional managers- \$1,195, Network-\$2,395. Includes check writing, recurring expenses, G/L, management reporting.

YARDI SYSTEMS, INC.

819 Reddick Street, Santa Barbara, CA 93103
(805) 966-3666

CIRCLE 765 ON READER SERVICE CARD

REAL ESTATE

The Landlord® & The Landmaster®

Property management software purchased by more than 5,000 owners and property managers since 1980. Handles residential and commercial tenant accounting; prints checks and statements. G/L and A/P included. From \$595 to \$2200.

The Landlord Software Center

427 East Patrick Street, Dept. E
Frederick, MD 21701 (301) 695-1544

CIRCLE 760 ON READER SERVICE CARD

SCIENTIFIC

Scientific SW - FREE CATALOG

A great selection of scientific software products for plotting, non-linear curve fitting, chemical equilibrium calculations, simulation, statistics, differential equations, symbolic algebra, and more.

MicroMath Scientific Software

Box 21550, Salt Lake City, UT 84121-0550
1-800-942-6284 FAX (801)943-0299

CIRCLE 766 ON READER SERVICE CARD

Midi Music With The Human Touch

Pop, Rock, Country, Oldies - We've Got It All!
The most widely used midi music in the world.
Over 1800 titles available for most systems -
Including General Midi Oriented Midi Files.
Order direct with your AMEX, VISA, MC -

TRYCHO MUSIC INTERNATIONAL

2166 W. Broadway, #330, Anaheim, CA 92804
(800) 543-8988 FAX: (909) 696-3571

CIRCLE 754 ON READER SERVICE CARD

SongWright Out Scores The Rest

"Impressive output...solid list of features."
An Electronic Musician survey proves SongWright the BEST BUY of all music notation software. Save hundreds of dollars. Make your music easy with SongWright. Only \$119.95.

SongWright Software

7 Loudoun Street S.E., Leesburg, VA 22075
(800) 877-8070 (703) 777-7232

CIRCLE 755 ON READER SERVICE CARD

Comtronic Property Manager™

Integrated mgmt & acct'g system for residential, retail & commercial properties. Supports lease controls & maint. tracking. Complete G/L w/recurring payables. Prints checks, notices, invoices & reports. Meets or exceeds all IREM standards.

COMTRONIC SYSTEMS, INC.

205 Harris Avenue, Cle Elum, WA 98922
Tel: (509) 674-7000 Fax: (509) 674-2383

CIRCLE 761 ON READER SERVICE CARD

CoPlot - 2D and 3D Scientific Graphs

Publication-quality output. Very flexible. With features that scientists need: error bars, sub/super scripts, and the full Greek alphabet. John Dvorak says: "Don't let the low price fool you; this is excellent software." \$159

CoHort Software

P.O. Box 1149, Berkeley, CA 94701
(800) 728-9878 Fax (510) 524-9199

CIRCLE 767 ON READER SERVICE CARD

PROGRAMMERS TOOLS

BASIC PROGRAMMING TOOLS

Crescent offers many tools for QuickBASIC, PDS, and Visual Basic, all with tutorials and full source. Assembly routines, graphics, screen design w/data entry, BASIC TSR's, and much more. No royalties. Call or write for our catalog.

CRESCENT SOFTWARE, INC.

11 Bailey Avenue, Ridgefield, CT 06877
Orders: 800-35-BASIC, Tech: 203-438-5300

Property Management

With Rental-Ease save \$\$ on your investment! Guaranteed to be the easiest & fastest property management system available at any price. Versions for owners, professionals, networks. \$395 to \$1295. Demo \$10. Dealers welcome!

Strategic Office Systems

688 N.500 W.#61, Mt. Pleasant, UT 84647
(800) 942-6784 or (801) 462-2130

CIRCLE 762 ON READER SERVICE CARD

STATISTICS

NCSS 5.x Series - \$125

"Best value & easiest to learn/use" PC-Week. Menus/Spreadsheet. Means, etc. Regression, t-tests, ANOVA, Factor, cluster & discriminant. Cross tabs. Nonparametrics. Histograms, Plots. Reads ASCII/Lotus. Many extra modules.

NCSS

329 North 1000 East, Kaysville, UT 84037
Phone: 801-546-0445 FAX: 801-546-3907

CIRCLE 768 ON READER SERVICE CARD

OPT-TECH SORT/MERGE

High Performance Sort/Merge/Select utility. Run as a standalone utility or call as a subroutine. Supports most languages and filetypes. Unlimited file size, multiple keys and much more! MS-DOS, Windows \$149, OS/2, Unix \$249.

Opt-Tech Data Processing

P.O. Box 678 - Zephyr Cove, NV 89448
(702) 588-3737 Fax: (702) 588-7576

CIRCLE 757 ON READER SERVICE CARD

Calling All Property Managers!

New! Commercial version - Property Pro™ calculates CAM's, Escalation's, etc. Use Tenant Pro™ for residential properties. Both streamline daily activities and provide vital management info. Special offer for REMS users.

Actoris Software Corporation

1100 Centennial #248, Richardson, TX 75081
800-964-2792, 214-231-7588, Fax: 214-231-6290

CIRCLE 763 ON READER SERVICE CARD

PsychStat MAX 2.2 - \$59.95

Frequency •descriptives •chi-square •ttests, ANOVAs •multiple regression •correlation •Likert & right-wrong item analysis •alpha •19 programs in all •coprocessor support •ASCII import •25500 variables •happy or money back.

PsychStat

1003 Justin Ln 2118, Austin, TX 78757
Tel/Fax: 512-451-8152

CIRCLE 769 ON READER SERVICE CARD

SURVEYS

#1 in Surveys - StatPac Gold IV

Professional's choice for survey & marketing research. User-friendly, comprehensive & dependable. Camera ready tables & graphics. Basic & advanced statistics. CRT & telephone interviewing. Easiest to learn. Guaranteed.

StatPac Inc.

3814 Lyndale Ave. S., Mpls., MN 55409
Tel: (612) 822-8252 Fax: (612) 822-1708

CIRCLE 770 ON READER SERVICE CARD

DATA CONVERSION

TAPE CONVERSION & DUPLICATION

ALL TAPE TYPES (1/4", TEAC, 4mm DAT, 8mm EXABYTE, DEC TKxx, 1/2", 3480, 3490) & All Formats (MICRO, NETWORK, UNIX, MINI & MAIN-FRAME) - Very Fast Turnaround & Realistic Pricing. Full Service for Data Recovery including Overwrites.

VOGON

USA 405-321-2585 Fax: 405-321-2741
UK 44+(0)734-890042 Fax: 44+(0)734-890040

CIRCLE 776 ON READER SERVICE CARD

HEAT IN THE NIGHT

FREE! FREE! FREE! FREE! FREE! FREE! FREE! FREE!
THE HOTTEST AND ONLY
FREE BBS in the country.
It's where erotic couples & singles meet.
Adult CHAT

ALWAYS FREE - NEVER A CHARGE!

1-515-FUNN-BBS

DATA RECOVERY SERVICES

The Survey System

Analyzes: marketing, public opinion, customer satisfaction, employee attitude surveys. Handles mail, personal, phone, scanner, disk-by-mail or computer interviews. Records verbatim text & voice answers. Powerful, flexible, user friendly. Free support.

Creative Research Systems

15 Lone Oak Ctr. Dept. P, Petaluma, CA 94952
Ph: (707) 765-1001 Fax (707) 765-1068

PC DATA RECOVERY SPECIALISTS

Your Data is important. Let the Company that specializes in SCSI Data Recovery and Hard Drive Repair provide you with expert service. CPR has been recognized in many computer pubs as a leader in SCSI Data Recovery.

Computer Peripheral Repair

7570 S. US Hwy 1 Hypoluxo, FL 33462
800-765-9292 407-586-0011 (FAX) 582-7921

CIRCLE 777 ON READER SERVICE CARD

THE BEST BBS IN THE UNIVERSE

Modem access to 55,000 (+) IBM compatible programs. Global INTERNET E-mail! FREE files for new users. Hundreds of new programs each week. Large ADULT section. 46 US Robotics 16.8 modem lines. No hourly fees. Amex/Master/Visa.

THE INVENTION FACTORY INC.

1200/2400 Baud (212) 274-8110 @ N-8-1
9600/16.8 Baud (212) 274-8298 @ N-8-1

CIRCLE 783 ON READER SERVICE CARD

UTILITIES

PEN PLOTTER EMULATOR

FPLLOT turns your printer into an HP pen plotter. Fast hi-res, no jagged lines. Vary line width, color. Screen preview - zoom, pan. Works with most CAD programs. Supports most printers. Requires DOS 2.1 or higher. \$119+\$3 S&H. VISA/MC/Chk/MO.

FPLLOT Corporation

24-16 Steinway St., Suite 605
Astoria, NY 11103 • 718-545-3505

CIRCLE 772 ON READER SERVICE CARD

ERGONOMICS

STOP COMPUTER PAIN NOW!

CompUrest™ relieves repetitive stress injuries by supporting your forearms and wrists while lowering your keyboard. Why stop at your wrist? Go all the way to computer comfort. Available in various materials. Meas. 21" X 23".

CompUcube, Inc.

U.S. Patent No. 5, 188,321
1-800-458-3842 or 212-757-8043

CIRCLE 778 ON READER SERVICE CARD

The Adult BBS Guidebook

- The first book to chart the world of cybersex.
- 128 pages, 100+ BBS's all across the country.
- Get a close-up look at 45 of the hottest boards.
- Locate boards that fit your budget & lifestyle.
- Send \$12.50 chk/mo. Not avail in bookstores.

Keyhole Publications

P.O. Box 35-BC, Sycamore, IL 60178

CIRCLE 784 ON READER SERVICE CARD

INSURANCE

FastTrax 4.0 The Best Disk Optimizer

Speeds disk access, reclaims wasted space. Defrags any size DOS disk incl. over 2Gb. No limits on directories, files or clusters. Unique in-cylinder method reduces seeks. MakeTrax (incl.) for custom file placement. \$70 or \$40 competitive upgrade.

FastTrax International

880 Ensenada Avenue, Berkeley, CA 94707
24-hr Sales and Tech Support (510) 525-3510

CIRCLE 773 ON READER SERVICE CARD

Insurance For Business Computers

Covers desktops, laptops, networks, all software, and even valuable data files. Don't settle for policies designed for home computers or office typewriters if you use your system for business. Low premiums. Call 24 hrs. to receive application.

DATA SECURITY INSURANCE

4800 Riverbend Road, Boulder, CO 80301
1-800-822-0901

DOWNLOAD FOR FREE @ 14.4K!

100,000's of WINDOWS, DOS, UTILS, AND GRAPHICS FILES! MULTILINE CHAT! ADULT AREAS, MULTIPLAYER GAMES, CASINO GAMBLING, ONLINE SHOPPING MALLS AND 100'S OF MESSAGE AREAS. SOMETHING FOR YOU!!!!

FREE - FREE - FREE - FREE

N/8/1 UP TO 14.4K
CALL 1-217-792-3663

CIRCLE 785 ON READER SERVICE CARD

WINDOWS

Pinpoint PC Bottlenecks

- Personal Measure shows how apps spend time.
- Upgrade or replace PCs based on hard facts.
- Identify network trouble spots.
- Resolve app problems using our services.
- \$125 + S&H (5.25" or 3.5") MC/VISA

SPIRIT OF PERFORMANCE, INC.

73 Westcott Road, Harvard, MA 01451
tel. 508/456-3889, telex 6503571400

CIRCLE 774 ON READER SERVICE CARD

Insures Your Computer

The COMPUTEROWNERS Insurance Policy provides replacement of hardware, media and purchased software. As little as \$49 a year covers theft, accidents, power surges and more! For information and to start coverage call 1-800-848-3469.

Safeware, The Insurance Agency Inc.

PO Box 02211, 2929 N. High St.
Columbus, OH 43202 800-848-3469

CIRCLE 780 ON READER SERVICE CARD

??? WHY PAY MORE ???

Access 400,000+ files, hundreds of online games, ALL InterNet features, a shopping mall of products, teleconferences, news, powerful mail system, encyclopedia, and much more at fractions of the cost of other large services.

TYRELL CORPORATION

Via modem (816) 45 INPUT ID:PMBC PW:1211
For more information call: 800-9-TYREL-1

CIRCLE 786 ON READER SERVICE CARD

MISCELLANEOUS BOOKS/CATALOGUES

COMPUTER BOOKS at 15% Discount

We specialize in ADVANCED books for developers, programmers, academics, users from 75 publishers. Free 16-page catalog. Worldwide shipping. Internet 70007.1333@COMPUSERVE.com
Personal, technical service. VISA/MC/AMEX/Disc

CompuBooks

Rt. 1, Box 271-D, Cedar Creek, TX 78612
800-880-6818 512-321-9652 FAX 512-321-4525

CIRCLE 775 ON READER SERVICE CARD

ON-LINE SERVICES

FREE SAMPLES IMAGES (GIFS)

BIKINI
LINGERIE
GLAMOUR
CELEBRITY
WANTED: GLAMOUR PHOTOGRAPHERS & MODELS

CLASSIC MODEL IMAGE BBS

(602) 997-6400 (MODEM #)
1-800-280-9661 (VOICE #)

CIRCLE 781 ON READER SERVICE CARD

TRAINING/TUTORIALS

Rent Training Videos by Mail

Over 70 different titles for Windows, DOS, Excel, WordPerfect, Lotus, Word, PageMaker, Harvard Graphics, dBase and more. A two week rental, including S&H, costs about a dollar a day. Return postage prepaid. Get a free catalog.

CareerTAPES® Enterprises

PO Box 309, Center Harbor, NH 03226
(603) 253-7470

CIRCLE 787 ON READER SERVICE CARD

A LITTLE COMPUTER KNOWLEDGE IS A DANGEROUS THING.

If you don't know all there is to know about a computer product category before you buy, you could be headed for trouble.

You could pay too much.
Or buy an outdated model.
Or end up trying to install a product that's incompatible with your system.

But with **Data Sources** you'll have all the information you need to make a good buying decision. Because it's all right at your fingertips. That's why the smart money consults **Data Sources**.

Everything is here. 75,000 software, hardware and data communications products



are listed with specs and prices. There are profiles on 14,000 companies with addresses, phone numbers and key personnel. All cross-indexed so you can quickly and easily compare brands.

And **Data Sources** keeps you current. It is issued every six months and constantly updated. Since last issue, 25,000 products and 1,700 companies were added or deleted from the listings.

Subscribe to **Data Sources** today.

It's everything you'll ever need to know about computer products. To order call

800-546-1223. Outside the U.S. call 212-503-5398.

datasources
THE COMPLETE COMPUTER PRODUCT BOOK

One Park Avenue, New York, New York, 10016 Fax: 212-503-5800



Advertising Sales Staff

One Park Avenue,
New York, NY 10016
212 503-5100

DISPLAY ADVERTISING

Dan Rosensweig -
Associate Publisher
(212) 503-5354
Anna Zornosa - Associate
Publisher/West Coast
(415) 378-5505
Robert Diftler - Central
Advertising Manager
(312) 346-7666
Lon Otremba -
East Coast
Advertising Director
(212) 503-4453
Sales Manager
Michael Hatherill
(212) 503-5128
Ad Systems Supervisor
Christine Holsten
(212) 503-5264
Advertising Coordinator
Julie Eigo
(212) 503-5107

MA, NH, VT, ME, RI

District Sales Manager
Kimberly Rene White
10 President's Landing, Mystic
Central
Medford, MA 02155
(617) 393-3055
Account Representative
Ira Becker
(212) 503-5132

CT, NY, NJ, PA

District Sales Manager
Michael Bird
One Park Avenue, 4th Floor
New York, NY 10016
(212) 503-5307
District Sales Manager
Lisa Friedman
(212) 503-5149
Sr. Account Representative
Karen Keavey
(212) 503-5333
Account Representatives
Andrew Jacobs
(212) 503-5130
Adam Power
(212) 503-5663

DE, MD, DC, VA, WV, NC, SC, AL,
MS, TN, AR, KY, GA, FL

Frank Quigley
3405 Piedmont Road, Suite 460
Atlanta, GA 30305
(404) 814-8950

Account Representative
Allyson Deane
(212) 503-5044

NE, WI, IL, IN, KS, MN, MO, OH,
MI, IA, ND, SD, Canada

District Sales Manager
Stephen Dress
150 North Wacker Drive, 25th Floor
Chicago, IL 60606
(312) 346-7666
District Sales Manager
Jay Overbye
(312) 346-7666
Sr. Account Representative
Beth Boyle
(212) 503-5047
Account Representative
Maureen Dooley
(212) 503-5126

TX, OK, LA, NM

District Sales Manager
Paul Klein
5956 Sherry Lane, Suite 625
Dallas, TX 75225
(214) 360-5725
Sr. Account Representative
Stephanie Brzozowski
(212) 503-5675

CA (San Diego & Orange County),
AZ, NV, HI

District Sales Manager
David Lynn (714) 852-5924
18500 Von Karman Avenue, Suite 510
Irvine, CA 92715
(714) 852-5914
District Sales Manager
Robin Kofsky
(714) 852-5920
Sr. Account Representative
Molly Shank
(212) 503-5113

CA (Los Angeles)

District Sales Manager
Mary Arlotto (213) 351-1811
3530 Wilshire Boulevard, Suite 645
Los Angeles, CA 90010
(213) 351-1810
Account Representative
Elizabeth O'Connor
(212) 503-5040

CA (San Jose)

District Sales Manager
Michael Klein (415) 378-5521
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520

Sr. Account Representative
Kathy Kottenbach
(212) 503-5041

Mike Kisseberth - Northwest
Advertising Manager
(415) 378-5510

CA (San Francisco & North), ID,
OR, WA

District Sales Representative
Todd Anderman (415) 378-5527
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520

District Sales Representative
Rick Vandervoorn
(415) 378-5523

Account Representative
Mike Madwig
(212) 503-5129

CA (South San Francisco to
Mountainview), CO, UT, WY, AK

District Sales Manager
Phylliss Egan
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-6859

Sr. Account Representative
Kathy Kottenbach
(212) 503-5041

Account Development Specialist
Ronni Reiburn
(212) 503-5104

For more information
regarding display
advertising please call:
212 503-5100
1-800-33MAG AD

CENTRAL ADVERTISING

VP, Central Advertising
Paul Stafford

Sales Manager
Monte Wasch

Production Manager
Vicki Egan

Sr. Production Coordinator
Nadine Messier

Production Coordinator
Berhan Asmarom

Sr. Advertising Coordinator
Wanda D. Brown

Advertising Coordinator
Krupal Prabhaker
CA (415, 408)

Account Representative
Michael Alexander
(212) 503-5118

AK, AZ, CA (209, 510, 707, 714, 805, 916),
CN, NM, OK, Foreign

Account Representative
Tim Castelli
(212) 503-5125

AL, AR, FL, GA, KY, LA, MS, NC, SC, TN,
TX, VA, WV

Account Representative
Leslie Eddy (South East)
(212) 503-5171

CT, MA, ME, NH, NJ, RI, VT

Account Representative
Bill Herbst
(212) 503-5193

NY, NJ, PA, DE, MD, VA, OH

Account Representative
Andrew Kramer
(212) 503-5150

CO, ID, MT, NV, OR, UT, WA, WY

Account Representative
Caroline Padron
(212) 503-5156

CA (213, 310, 619, 818), HI

Account Representative
Claudia Porfilio
(212) 503-5184

IA, IL, IN, KS, MI, MN, MO, ND, NE, SD,
WI

Account Representative
Tim Stanton
(212) 503-5175

Business Card Account
Representative
Carolyn Goldfarb (212) 503-5076 &
Aily Klarin (212) 503-5034
PC Magazine Marketplace
3rd Floor, One Park Ave.
New York, NY 10016

For more information
regarding central
advertising please call:
212 508-5115
1-800-825-4237

Advertisers' Index COMPANIES

Reader Service No.	Advertiser	Page
293	3 Com Corporation.....	252-253
167	3M Data Storage Products	237
034	Acer America.....	65
117	Adaptec.....	201
130	Advanced Logic Research.....	61
047	Advanced Micro Devices.....	206
227	Altima Systems, Inc.....	309
192	Altsys Corporation.....	47
194	Amax Engineering	89
165	Amdek	420
162	American Power Conversion.....	83
209	Ariel Design Inc	370
336	Arlington Computer Products.....	418
254	Artisoft Inc.....	306
008	ASP Computer Products.....	88
215	AST Research	20-21
228	ATI Technologies Inc.....	327
012	Austin Computer Systems.....	375-378
156	Austin Computer Systems.....	379
295	Borland International.....	6
220	Borland International.....	54-55
328	Buffalo Products.....	424
015	Bulldog Computer Products.....	422
190	CallSoft.....	80
187	Canon, U.S.A.	241
079	Central Point Software	135
073	Colorado Memory Systems.....	36
137	Compaq Computer Corporation.....	121-128
062	Compaq Computer Corporation.....	202-203
308	Compaq Computer Corporation.....	204-205
131	CompuAdd Express.....	196
128	CompuAdd Express.....	256-257
126	CompuAdd	101-104
205	Compuclassics.....	419
132	Compudyne.....	84-85
144	Compudyne.....	264-265
300	Computability	408-409
348	Computer Associates	5
075	Computer Associates	26-27
400	Computer Associates	43
159	COMPUTER DISCOUNT WAREHOUSE.....	394-395
109	COMPUTER DISCOUNT WAREHOUSE.....	396-397
177	Computer Express	410
009	Computer Library	459
316	Comtrade	381
086	Creative Labs	251
061	Crosstalk Inc	14-15
068	DacEasy, Inc	425
389	DCA.....	23
*	Dell Computer Corporation	78-79
*	Dell Computer Corporation	C5-C8
*	Dell Computer Corporation	130-131
*	Dell Computer Corporation	161-165
*	Dell Computer Corporation	311
049	Digital Equipment Corporation	189-192
002	Digital Products Inc.....	100
150	Dresselhaus Computer Pro.....	118
243	DUSTIN DISCOUNT SOFTWARE.....	362
347	DUSTIN DISCOUNT SOFTWARE.....	366-367
059	E. J. Bilingual.....	117
362	Eastman Kodak Company.....	94
090	Eastman Kodak Company.....	254-255
197	EPS Technology.....	383

Reader Service No.	Advertiser	Page
003	Expo Tech	372
305	Expo Tech	406-407
142	Fargo Electronics	41
382	First Source International	414-415
103	Frame Technology.....	235
200	FTG Data Systems	357
*	Gateway 2000.....	48A-L
277	Global Horizons, Inc	423
342	Grid Systems Corporation	141
391	H.Co Memory Upgrades.....	421
136	Hayes Microcomputer Products.....	76
120	Hayes Microcomputer Products.....	277
116	Hewlett Packard Dashboard	199
244	Hewlett Packard Peripheral Group	74-75
*	Hewlett Packard Peripheral Group	106-107
*	Hewlett Packard Peripheral Group	151
275	Hyundai Electronics	346
*	IBM Corporation	279-284
*	IBM Personal Software Products.....	139
*	IBM Personal Software Products.....	355
110	IMSI	348
164	Insight Distribution Network.....	398-401
181	Integrated Information Tech.....	266
363	Intel Corporation.....	153-156
048	Intergraph Corp	181-186
378	Iomega	147
106	Kingston Technology	289
195	KT Technology Pte Ltd.....	299
370	Kyocera Electronics.....	334-0
019	L.A. Trade.....	416
081	Lexmark Input Technology.....	315
024	Lexmark International.....	16-17
*	Lotus Development Corporation	45
*	Lotus Development Corporation	68-69
*	Lotus Development Corporation	72
*	Lotus Development Corporation	142-143
*	Lotus Development Corporation	242-243
143	Lotus Development Corporation	320-323
263	Macola, Inc	216-217
365	Manugistics.....	271
154	Mathsoft Inc.....	325
124	Matrox, Inc	319
085	Micro Electronics	119
005	Micro Solutions Computer Products.....	197
119	Micron Computers	259-262
*	Microsoft	2-3
*	Microsoft	90-91
*	Microsoft	148-149
*	Microsoft	175
*	Microsoft	349
225	MicroWarehouse	209-210
010	Midwest Computer Works	412
280	Mitsubishi Electronics	62-63
283	Nanao Corporation.....	351
157	NEC Technologies	C2-C4,p1
044	NEC Technologies	226-227
153	NEC Technologies	228-229
394	NEC Technologies	230-231
170	Nikon	317
*	Northgate Computer Systems	96-97
*	Northgate Computer Systems	294-295
133	On-Track Computer Systems.....	82
*	Pacific Data Products, Inc	223

Reader Service No.	Advertiser	Page
*	Pacific Data Products, Inc	333
145	Pacific Wave Technology.....	413
122	Panasonic Comm. & Systems Co.....	57
029	PC Brand.....	70
*	PC Connection	246-249
199	PC Zones.....	310
092	PCs Compleat.....	402-403
268	PCs Compleat.....	404-405
026	Personics.....	4
089	PK Ware.....	170
108	Polaris Software.....	195
058	Practical Peripherals	213
148	Primavera Systems	58
084	Quantum.....	286
289	RadioShack	159
046	Samsung Information Systems	172
296	SAMTRON	18
*	Scitor Corporation	13
*	Seagate Technology.....	67
114	Seiko Instruments	343
213	Sigma Data	179
399	Sigma Designs, Inc.....	86
212	SoftMaker	341
282	Software Spectrum	345
127	SuperMac Technologies.....	98
183	Supra Corporation	337
279	SyDOS	177
344	Symantec Corporation.....	28
186	Symantec Corporation.....	137
045	Tangent Computer, Inc	368
001	Tektronix Inc	167
206	TELEMART	417
304	Texas Instruments.....	108
353	Texas Instruments.....	171
139	Texas Instruments.....	353
330	Thomas Conrad Corporation.....	273
379	Toshiba America	114-115
004	Touchstone Software	176
121	Tri-Star Computers.....	384
191	Tseng Labs Inc.....	169
091	Tune 1000.....	312
140	Univel.....	218
231	US Robotics Inc	298
065	USA Flex.....	386-387
210	USA Flex.....	388-389
051	USA Flex.....	390-391
118	View Sonic.....	198
207	Wollongong Group	331
*	WordPerfect Corporation	10-11
*	WordPerfect Corporation	214-215
087	Worldwide Technologies	411
*	Yamaha Music	329
036	Zeos Int'l	24-25
115/035	Zeos Int'l	33
063	Zeos Int'l	34-35
038	Zeos Int'l	51
125	Zeos Int'l	92
151	Zeos Int'l	32A-F
069	Ziff-Davis Press	393
354	ZiffNet.....	274-275

* No Reader Service #. Please Call Advertiser For Information.

Advertisers' Index PRODUCTS

Reader Service No.

Company

Product

Page

ACCELERATOR BOARDS			
228	ATI Technologies Inc.	ATI Graphics Accelerators	327
124	Matrox, Inc.	MGA	319
ACCOUNTING SOFTWARE			
348	Computer Associates	Simply Accounting	5
068	DecEasy, Inc.	DecEasy Accounting	425
263	Macola, Inc.	Accounting Software	216-217
ADD-ON BOARDS			
228	ATI Technologies Inc.	ATI Graphics Accelerators	327
086	Creative Labs	Video Blaster	251
382	First Source International	Memory	414-415
213	Sigma Data	Upgrades	179
399	Sigma Designs, Inc.	WinStorm	86
ANTI-VIRUS SOFTWARE			
186	Symantec Corporation	Nonon Anti-Virus	137
BACKUP SOFTWARE			
005	Micro Solutions Computer Products	Tape Backup	197
BOOKS			
069	Ziff Davis Press	Books	393
CAD/CAM			
110	IMSI	TurboCAD for Windows	348
048	Intergraph Corp.	Microstation	181-186
	Pacific Data Products, Inc.	Protracer	333
CD-ROM			
300	Computability	Mail Order	408-409
243	DUSTIN DISCOUNT SOFTWARE	CD ROM	362
005	Micro Solutions Computer Products	CD ROM	197
153	NEC Technologies	CD-ROM	228-229
051	USA Flex	Peripherals	390-391
CHIPS PROCESSORS			
047	Advanced Micro Devices	386 Microprocessor	206
363	Intel Corporation	Pentium	153-156
191	Tseng Labs Inc.	Video Chips	169
CD-PROCESSORS			
213	Sigma Data	Upgrades	179
COMMUNICATIONS SOFTWARE			
061	Crosstalk Inc.	Crosstalk for Windows	14-15
120	Hayes Microcomputer Products	Smartcom	277
263	Macola, Inc.	Communications Software	216-217
133	On-Track Computer Systems	Network Data Recovery Utility	82
COMPUTERS COMPATIBLES			
034	Acer America	PC's	65
130	Advanced Logic Research	Systems	61
227	Altima Systems, Inc.	Notebook PC's	309
194	Amaz Engineering	Amaz PC's	89
209	Anel Design Inc.	Computers	370
215	AST Research	Pen Notebooks	20-21
012	Austin Computer Systems	Austin Desktops	375-378
156	Austin Computer Systems	Austin Desktops	379
015	Bulldog Computer Products	Compables	422
137	Compaq Computer Corporation	Compaq Direct Plus	121-128
126	CompuAdd	Compuadd Systems	101-104
131	CompuAdd Express	CompuAdd Express Systems	196
128	CompuAdd Express	CompuAdd Express Systems	256-257
132	CompuDyne	CompuDyne Desktops	84-85
159	COMPUTER DISCOUNT WAREHOUSE	Hardware, Peripherals	394-395
109	COMPUTER DISCOUNT WAREHOUSE	Hardware, Peripherals	396-397
316	Comrade	Systems, Mail Order	381
	Dell Computer Corporation	Dell Systems	78-79
	Dell Computer Corporation	Dell Systems	C5-C8
	Dell Computer Corporation	Dellware	130-131
	Dell Computer Corporation	Dell Systems	161-165
	Dell Computer Corporation	Dell Systems	311
049	Digital Equipment Corporation	Systems	129-132
197	EPS Technology	Systems	383
003	Expo Tech	486DX/50 Mhz, 486SX/25 Mhz	372
306	Expo Tech	486DX/50 Mhz, 486SX/25 Mhz	406-407
	Gateway 2000	PC's	48A-L
277	Global Horizons, Inc.	Systems, Peripherals, Components	423
342	Gnd Systems Corporation	GRD Desktops	141
275	Hyundai Electronics	Notebooks	346
	IBM Corporation	PS Valuepoint	279-284
085	Micro Electronics	WinBook Notebook	119
119	Micro Computers	Micron PC's	259-262
010	Midwest Computer Works	PC's, Hardware	412
044	NEC Technologies	Desktop Computers	226-227
	Northgate Computer Systems	PC's, Notebooks	96-97
	Northgate Computer Systems	PC's, Notebooks	294-295
145	Pacific Wave Technology	Computers, Mail Order	413
029	PC Brand	Mail Order PC's	70-71
092	PCs Complete	Computers, Mail Order	402-403
268	PCs Complete	Computers, Mail Order	404-405
289	RadioShack	Tandy Sensation	159
045	Tangent Computer, Inc.	486's	368
121	Tri-Star Computers	Systems	384
065	USA Flex	Notebooks/Compatibles	386-387
210	USA Flex	USA Flex Systems	388-389
036	Zeos Int'l	Zeos Contende	24-25
115/005	Zeos Int'l	Z-Card/Z-Quote	33
063	Zeos Int'l	Zeos Freestyle/SL	34-35
038	Zeos Int'l	Color Notebook	51
125	Zeos Int'l	Zeos 486 DX2-66	92
151	Zeos Int'l	Zeos Upgradable Systems	32A-F
DATA BASE MANAGERS			
295	Borland International	Borland Office	6
220	Borland International	dBase 2.0	54-55
075	Computer Associates	Chopper	26-27
400	Computer Associates	dBase	43
026	Parsons	Monarch	4
108	Polans Software	PackRat	195
DATA COMPRESSION HARDWARE			
181	Integrated Information Tech.	XtraDrive 3.0	266

Reader Service No.

Company

Product

Page

DATA COMPRESSION SOFTWARE			
133	On-Track Computer Systems	Network Data Recovery Utility	82
089	PK Ware	PK Zip/PK Lite	170
DESK TOP PUBLISHING			
103	Frame Technology	FrameMaker 3.0	235
DISK BACKUP & TAPE DRIVES			
167	3M Data Storage Products	3M Data Storage Products	237
073	Colorado Memory Systems	Jumbo Backup	36
378	Computability	Mail Order	408-409
005	Micro Solutions Computer Products	Bernoulli	147
		Tape Backup/Disk Drives	197
DISKETTES			
167	3M Data Storage Products	3M Data Storage Products	237
DISPLAYS-MONITORS-TERMINALS			
165	Amdel	Amdel Monitors	420
336	Arlington Computer Products	Mail Order	418
010	Midwest Computer Works	Monitors	412
280	Mitsubishi Electronics	Monitors	62-63
283	Nanac Corporation	High Resolution Monitors	351
157	NEC Technologies	NEC Monitors	C2-C4, p1
046	Samsung Information Systems	Monitors	172
296	SAMTRON	Monitors	18
051	USA Flex	Peripherals	390-391
118	View Sonic	High Resolution Monitors	198
ELECTRONIC MAIL			
	Lotus Development Corporation	Lotus Notes	45
	Lotus Development Corporation	CC Mail	72
	Microsoft	PC Mail Remote	90-91
ENTERTAINMENT SOFTWARE			
091	Tune 1000	Soft Karaoke	312
FONT CARTRIDGES			
002	Digital Products Inc.	Print Director	100
FONT SOFTWARE			
192	Alsys Corporation	Fontographer	47
212	SoftMaker	Fonttype Volumes I & II	341
FOREIGN SOFTWARE			
059	E J Bilingual	Translation Software	117
FORM DESIGNERS			
	WordPerfect Corporation	WordPerfect Informs 1.0	10-11
GRAPHICS SOFTWARE			
190	CallSoft	Software	80
HARD DISKS			
300	Computability	Mail Order	408-409
164	Insight Distribution Network	Hard Disks	398-401
195	KT Technology Pte Ltd	Hard Disk Drive	239
005	Micro Solutions Computer Products	Disk Drives	197
084	Quantum	Hard Card	286
	Seagate Technology	200MB Hard Drive	67
279	SyDOS	Marlin Puma	177
HARDWARE			
164	Insight Distribution Network	Hardware	398-401
145	Pacific Wave Technology	Computers, Mail Order	413
199	PC Zones	Mail Order	310
058	Practical Peripherals	Technology	213
206	TELEMARK	Hardware	417
INFORMATION MANAGERS			
	Lotus Development Corporation	Lotus Notes	45
108	Polans Software	PackRat	195
INPUT DEVICES			
200	FTG Data Systems	Light Pen	357
081	Lexmark Input Technology	Ergonomic Input Devices	315
	Microsoft	Mouse	148-149
INTEGRATED SOFTWARE			
282	Software Spectrum	Microsoft Office	345
LAN ADAPTER BOARDS			
293	3 Com Corporation	TokenLink III	252-253
106	Kingston Technology	Ethernet PocketLAN	289
	Microsoft	Windows for Workgroups	349
LOCAL AREA NETWORKING			
117	Adaptec	SCSI	201
254	Artisoft Inc.	LANtastic	306
008	ASP Computer Products	JetLAN	88
328	Buffalo Products	Printer Sharing	424
015	Bulldog Computer Products	Networking	422
300	Computability	Mail Order	408-409
159	COMPUTER DISCOUNT WAREHOUSE	Networking Products	394-395
109	COMPUTER DISCOUNT WAREHOUSE	Networking Products	396-397
389	DCA	Remote LAN Node	23
002	Digital Products Inc.	Print Director	100
106	Kingston Technology	Ethernet PocketLAN	289
024	Lexmark International	Laser Printers	16-17
	Northgate Computer Systems	Networking Products	96-97
	Northgate Computer Systems	Networking Products	294-295
133	On-Track Computer Systems	Network Data Recovery Utility	82
058	Practical Peripherals	Technology	213
045	Tangent Computer, Inc.	Servers	368
330	Thomas Conrad Corporation	Ethernet Products	273
231	US Robotics Inc.	Shared Access	298
207	Wolffong Group	Pathway Access	331
MAIL ORDER			
130	Advanced Logic Research	Systems	61
165	Amdel	Amdek Monitors	420
209	Anel Design Inc.	Computers	370
336	Arlington Computer Products	Mail Order	418
012	Austin Computer Systems	Austin Desktops	375-378
156	Austin Computer Systems	Austin Desktops	379
015	Bulldog Computer Products	Mail Order	422
190	CallSoft	Software	80

Advertisers' Index PRODUCTS

Reader Service

No.	Company	Product	Page
137	Compaq Computer Corporation	Compaq Direct Plus	121-128
205	Compuclassics	Mail Order Products	419
132	Compudyme	Compudyme Desktops	84-85
144	Compudyme	Compudyme Notebooks	264-265
300	Computability	Mail Order	408-409
159	COMPUTER DISCOUNT WAREHOUSE	Mail Order	394-395
177	Computer Express	Mail Order	410
316	Comtrade	Systems, Mail Order	381
049	Digital Equipment Corporation	Systems	189-192
347	DUSTIN DISCOUNT SOFTWARE	Dustin Laundry List	366-367
197	EPS Technology	Systems, Notebooks, Mail Order	383
003	Expo Tech	486DX2/50 Mhz, 486SX/25 Mhz	372
305	Expo Tech	486DX2/50 Mhz, 486SX/25 Mhz	406-407
382	First Source International	Memory	414-415
277	Gateway 2000	Mail Order	484-L
342	Global Horizons, Inc.	Systems, Software, Components	423
275	Grid Systems Corporation	GRD Convertible	141
164	Hyundai Electronics	Notebooks	346
019	IBM Corporation	PS/Valuepoint	279-284
225	Insight Distribution Network	Hardware, Systems, Hard Drives	398-401
010	L.A. Trade	Mail Order	416
145	MicroWarehouse	Mail Order	209-210
029	Midwest Computer Works	Mail Order	412
199	Northgate Computer Systems	Mail Order	96-97
092	Northgate Computer Systems	Mail Order	294-295
268	Pacific Wave Technology	Computers, Software, Mail Order	413
289	PC Brand	Mail Order PC's	70
045	PC Connection	Mail Order	246-249
206	PC Zones	Mail Order	310
121	PCs Complete	Computers, Mail Order	402-403
065	PCs Complete	Computers, Mail Order	404-405
210	RadioShack	Tandy Sensation	159
051	Tangent Computer, Inc.	486's, Servers	368
087	TELEMART	Hardware & Software Reseller	417
036	Tri-Star Computers	Systems	384
115-035	USA Flex	Notebooks/Compatibles	386-387
038	USA Flex	USA Flex Systems	388-389
125	USA Flex	Peripherals	390-391
151	Worldwide Technologies	Memory	411
048	Zeos Int'l	Zeos Contenda	24-25
300	Zeos Int'l	Z-Card/Z-Quote	33
378	Zeos Int'l	Zeos Freestyle/SL	34-35
279	Zeos Int'l	Color Notebook	51
	Zeos Int'l	Zeos 486 DX2-66	92
	Zeos Int'l	Zeos Upgradable Systems	32A-F
MAPPING SOFTWARE			
048	Intergraph Corp.	Microstation	181-186
MASS STORAGE			
300	Computability	Mail Order	408-409
378	Iomega	Bernoulli	147
279	Seagate Technology	200MB Hard Drive	67
	SyDOS	Marlin Puma	177
MEMORY			
382	First Source International	Memory	414-415
391	H Co Memory Upgrades	Memory	421
019	L.A. Trade	Memory	416
213	Sigma Data	Upgrades	179
087	Worldwide Technologies	Memory	411
MISCELLANEOUS			
058	Practical Peripherals	Technology	213
354	ZiffNet	ZiffNet	274-275
MODEMS			
336	Arlington Computer Products	Mail Order	418
300	Computability	Mail Order	408-409
136	Hayes Microcomputer Products	Optima	76
183	Supra Corporation	Supra Fax/Modems	337
231	US Robotics Inc.	Shared Access	298
065	USA Flex	Notebooks/Compatibles	386-387
MULTI-MEDIA			
228	ATI Technologies Inc.	ATI Graphics Accelerators	327
190	CallSoft	Software	80
086	Creative Labs	Video Blaster	251
243	DUSTIN DISCOUNT SOFTWARE	CD ROM	362
289	RadioShack	Tandy Sensation	159
091	Tune 1000	Soft Karaoke	312
	Yamaha Music	Hello!Music!	329
ON LINE DATABASE			
354	ZiffNet	ZiffNet	274-275
OPERATING SYSTEMS ENVIRONMENTS			
	IBM Personal Software Products	OS/2	355
OS/2 SOFTWARE			
	IBM Personal Software Products	C Set + +	139
	IBM Personal Software Products	OS/2	355
	WordPerfect Corporation	WordPerfect 5.2 for OS/2	214-215
PAYROLL PERSONNEL			
068	DacEasy, Inc.	DacEasy Accounting	425
PC ACCESSORIES			
005	Micro Solutions Computer Products	Tape Backup, CD ROM, Disk Drives	197
065	USA Flex	Notebooks/Compatibles	386-387
PC DIRECT			
165	Amdel	Amdel Monitors	420
209	Anel Design Inc.	Computers	370
336	Arlington Computer Products	Mail Order	418
012	Austin Computer Systems	Austin Desktops	375-378
158	Austin Computer Systems	Austin Desktops	379
328	Buffalo Products	Printer Sharing	424
015	Buildlog Computer Products	Mail Order	422
205	Compuclassics	Mail Order Products	419
300	Computability	Mail Order	408-409
159	COMPUTER DISCOUNT WAREHOUSE	Mail Order	394-395
109	COMPUTER DISCOUNT WAREHOUSE	Mail Order	396-397
177	Computer Express	Mail Order	410
316	Comtrade	Systems, Mail Order	381
347	DUSTIN DISCOUNT SOFTWARE	Dustin Laundry List	366-367
197	EPS Technology	Systems, Notebooks, Mail Order	383
003	Expo Tech	486DX2/50 Mhz, 486SX/25 Mhz	372

Reader Service

No.	Company	Product	Page
305	Expo Tech	486DX2/50 Mhz, 486SX/25 Mhz	406-407
382	First Source International	Memory	414-415
277	Global Horizons, Inc.	Systems, Peripherals, Components	423
391	H Co Memory Upgrades	Memory	421
164	Insight Distribution Network	Hardware, Systems, Hard Drives	398-401
019	L.A. Trade	Memory, Mail Order	416
010	Midwest Computer Works	Hardware, PCs, Monitors Reseller	412
199	PC Zones	Mail Order	310
092	PCs Complete	Computers, Mail Order	402-403
045	Tangent Computer, Inc.	486's, Servers	368
206	TELEMART	Hardware & Software Reseller	417
121	Tri-Star Computers	Systems	384
065	USA Flex	Notebooks/Compatibles	386-387
210	USA Flex	USA Flex Systems	388-389
051	USA Flex	Peripherals	390-391
087	Worldwide Technologies	Memory	411
PC-FAX			
183	Supra Corporation	Supra Fax/Modems	337
PERIPHERAL SHARING DEVICE			
117	Adaptec	SCSI	201
008	ASP Computer Products	JetLAN	88
328	Buffalo Products	Printer Sharing	424
002	Digital Products Inc.	Print Director	100
150	Dresselhaus Computer Pro	Printer Sharing Device	118
	Pacific Data Products, Inc.	Direct Net	223
PERIPHERALS			
165	Amdel	Amdel Monitors	420
159	COMPUTER DISCOUNT WAREHOUSE	Peripherals	394-395
109	COMPUTER DISCOUNT WAREHOUSE	Peripherals	396-397
	Gateway 2000	Peripherals	484-L
277	Global Horizons, Inc.	Peripherals	423
244	Hewlett Packard Peripheral Group	H.P. Printers	74-75
	Hewlett Packard Peripheral Group	H.P. SCANJET	106-107
	Hewlett Packard Peripheral Group	H.P. LASERJET 4M	151
164	Insight Distribution Network	Hardware, Systems	398-401
	Microsoft	Mouse	148-149
145	Pacific Wave Technology	Computers, Mail Order	413
058	Practical Peripherals	Technology	213
	Yamaha Music	Hello!Music!	329
POINT OF SALE SOFTWARE			
068	DacEasy, Inc.	DacEasy Accounting	425
PORTABLE LAP COMPUTERS			
227	Aloma Systems, Inc.	Notebook PC's	309
215	AST Research	Pen Notebooks	20-21
137	Compaq Computer Corporation	Compaq Direct Plus	121-128
062	Compaq Computer Corporation	Portables	202-203
308	Compaq Computer Corporation	Portables	204-205
126	CompuAdd	CompuAdd Systems	101-104
131	CompuAdd Express	CompuAdd Express Systems	196
128	CompuAdd Express	CompuAdd Express Systems	256-257
144	Compudyme	Compudyme Notebooks	264-265
159	COMPUTER DISCOUNT WAREHOUSE	Laptops	394-395
109	COMPUTER DISCOUNT WAREHOUSE	Laptops	396-397
	Dell Computer Corporation	Dell Systems	78-79
	Dell Computer Corporation	Dell Systems	C5-C8
	Dell Computer Corporation	Dell Systems	151-155
	Dell Computer Corporation	Dell Systems	311
049	Dell Computer Corporation	Systems	189-192
197	Digital Equipment Corporation	Notebooks	383
003	Expo Tech	Notebooks	372
305	Expo Tech	Notebooks	406-407
	Gateway 2000	Notebooks	484-L
277	Global Horizons, Inc.	Systems, Peripherals, Components	423
342	Grid Systems Corporation	GRD Notebooks	141
275	Hyundai Electronics	Notebooks	346
085	Micro Electronics	WinBook Notebook	119
119	Micro Computers	Micron PC's	259-262
010	Midwest Computer Works	Hardware, PC's	412
394	NEC Technologies	Versa	230-231
029	PC Brand	Mail Order PC's	70-71
304	Texas Instruments	Ti TravelMate Notebooks	108
379	Toshiba America	T4500 Notebook	114-115
065	USA Flex	Notebooks/Compatibles	386-387
210	USA Flex	USA Flex Systems	388-389
038	Zeos Int'l	Zeos Contenda	24-25
063	Zeos Int'l	Zeos Freestyle/SL	34-35
POWER PROTECTION			
162	American Power Conversion	Back Ups	83
PRESENTATION SOFTWARE			
	Lotus Development Corporation	Freelance Graphics for Windows	242-243
PRINTER ACCESSORIES			
008	ASP Computer Products	JetLAN	88
PRINTERS			
336	Arlington Computer Products	Mail Order	418
187	Canon, U.S.A.	CJ10	241
300	Computability	Mail Order	408-409
002	Digital Products Inc.	Print Director	100
362	Eastman Kodak Company	Diconex 701 Printer	94
090	Eastman Kodak Company	450 GL Digital Color Printer	254-255
142	Fargo Electronics	Primer Color Printer	41
244	Hewlett Packard Peripheral Group	H.P. Printers	74-75
	Hewlett Packard Peripheral Group	H.P. LASERJET 4M	151
370	Kyocera Electronics	Printer	334-0
024	Luxmark International	Laser Printers	18-17
145	Pacific Wave Technology	Computers, Mail Order	413
122	Panasonic Comm. & Systems Co.	DMP	57
114	Sekio Instruments	ColorPoint PSX	343
399	Sigma Designs, Inc.	WinStorm	86
001	Tektronix Inc.	Color Printer	167
353	Texas Instruments	Ti MicroLaser Printers	171
139	Texas Instruments	Ti MicroWriter	353
051	USA Flex	Peripherals	390-391
PROGRAM DEVELOPERS/GENERATORS			
	IBM Personal Software Products	C Set + +	139
PROGRAMMERS TOOLS UTILITIES			
	IBM Personal Software Products	C Set + +	139
133	On-Track Computer Systems	Network Data Recovery Utility	82

Advertisers' Index PRODUCTS

Reader Service No.	Company	Product	Page
PROJECT MANAGEMENT			
188	Microsoft	Project for Windows	175
	Primavera Systems	Project Management	58
	Schior Corporation	Project Scheduler 5.0	13
REMOTE COMPUTING			
389	DCA	Remote LAN Node	23
207	Wollongong Group	Pathway Access	331
RESELLERS			
205	Compuclassics	Mail Order Products	419
108	COMPUTER DISCOUNT WAREHOUSE	Reseller	396-397
009	Computer Library	Data Sources	459
347	DUSTIN DISCOUNT SOFTWARE	Dustin Laundry List	366-367
277	Global Horizons, Inc.	Systems, Software, Components	423
010	Midwest Computer Works	Reseller	412
145	Pacific Wave Technology	Computers, Software, Mail Order	413
206	TELEMARK	Hardware & Software Reseller	417
SCANNERS/DIGITIZERS			
187	Canon, U.S.A.	CJ10	241
061	Hewlett Packard Peripheral Group	H P SCANJET	106-107
061	Lazmark Input Technology	Keyboards	315
170	Nikon	Scanner	317
SERVERS			
045	Tangent Computer, Inc.	Servers	368
SOFTWARE			
300	Computability	Mail Order	408-409
	Dell Computer Corporation	Dellware	130-131
347	DUSTIN DISCOUNT SOFTWARE	Dustin Laundry List	366-367
048	Intergraph Corp.	MicroStation	181-186
	Lotus Development Corporation	Lotus Notes	45
263	Macola, Inc.	Software	216-217
365	Manugistics	Statgraphics Plus	271
133	On-Track Computer Systems	Network Data Recovery Utility	82
145	Pacific Wave Technology	Software, Mail Order	413
199	PC Zones	Mail Order	310
206	TELEMARK	Software	417
SPREADSHEET TEMPLATES			
295	Borland International	Borland Office	6
	Lotus Development Corporation	Lotus 1-2-3 for Windows	68-69
	Lotus Development Corporation	Lotus Improv	142-143
STATISTICAL SOFTWARE			
365	Manugistics	Statgraphics Plus	271
154	Mathsoft Inc.	Mathcad 4.0	325
TRACK BALLS			
081	Lazmark Input Technology	Trackball	315
UNIX PRODUCTS			
140	Univel	Unaware	218
UTILITIES			
079	Central Point Software	PC Tools 8.0	135
116	Hewlett Packard Dashboard	Hewlett Packard Dashboard	199
048	Intergraph Corp.	MicroStation	181-186
133	On-Track Computer Systems	Network Data Recovery Utility	82
344	Symantec Corporation	Norton Utilities 7.0	28
004	Touchstone Software	Check it Plus	176
VERTICAL MARKET SOFTWARE			
154	Mathsoft Inc.	Mathcad 4.0	325
VIDEO GRAPHICS BOARDS			
336	Arlington Computer Products	Mail Order	418
228	ATI Technologies Inc.	ATI Graphics Accelerators	327
300	Computability	Mail Order	408-409
086	Creative Labs	Video Blaster	251
124	Matrox, Inc.	MG+	319
127	SuperMac Technologies	Spectrum24	98
191	Tseng Labs Inc.	Video Chips	169
051	USA Flex	Peripherals	390-391
WINDOWS SOFTWARE			
192	Altisys Corporation	Fontographer	47
295	Borland International	Borland Office	6
220	Borland International	DBase 2.0	54-55
190	CalSoft	Software	80
400	Computer Associates	dBaseFast	43
061	Crosstalk Inc.	Crosstalk for Windows	14-15
068	DacEasy, Inc.	DacEasy Accounting	425
120	Hayes Microcomputer Products	Smartcom	277
116	Hewlett Packard Dashboard	Hewlett Packard Dashboard	199
110	IMSI	TurboCAD for Windows	348
048	Intergraph Corp.	MicroStation	181-186
	Lotus Development Corporation	Lotus Notes	45
	Lotus Development Corporation	Lotus 1-2-3 for Windows	68-69
	Lotus Development Corporation	CC Mail	72
	Lotus Development Corporation	Lotus Improv	142-143
	Lotus Development Corporation	Freelance Graphics for Windows	242-243
143	Lotus Development Corporation	Ami Pro 3.0	320-323
263	Macola, Inc.	Windows Software	216-217
	Microsoft	Windows Office	2-3
	Microsoft	PC Mail Remote	90-91
	Microsoft	Mouse	148-149
	Microsoft	Project for Windows	175
	Microsoft	Windows for Workgroups	349
108	Polans Software	PackRat	195
282	Software Spectrum	Microsoft Office	345
091	Tune 1000	Soft Karaoke	312
	WordPerfect Corporation	WordPerfect Informs 1.0	10-11
WORD PROCESSING SOFTWARE AIDS			
295	Borland International	Borland Office	6
190	CalSoft	Software	80
143	Lotus Development Corporation	Ami Pro 3.0	320-323
	WordPerfect Corporation	WordPerfect 5.2 for OS/2	214-215
WORK GROUP SOFTWARE			
048	Intergraph Corp.	MicroStation	181-186
	Lotus Development Corporation	Lotus Notes	45
WORKSTATIONS			
049	Digital Equipment Corporation	Systems	189-192
213	Sigma Data	Upgrades	179

For Additional Categories See MARKETPLACE PRODUCT INDEX page 425.



Coming Up

The Good, the Bad, and the SCSI

Everything you always wanted to know about SCSI but were afraid to ask. *PC Magazine* gives an in-depth explanation of what SCSI is and what it can do for you.

RAID to the Rescue

With the ever-expanding reach of networks into the workplace comes a need to maintain data integrity and guard against the potentially catastrophic results of hard disk failure. *PC Magazine* looks at six RAID solutions for NetWare networks that promise to protect against data loss and to maintain uninterrupted system operation during the repair and restoration process.

V.32bis Modems

V.32bis modems using data compression and error control can transfer data at up to 57.6 kilobits per second. Last time we reviewed these superfast modems, there were just 14 on the market. Now over 60 varieties are available. Our technology-oriented primer dissects the results of ZD Labs' rigorous modem performance testing and explains how to choose the modem most appropriate for your needs and budget.

Enter the First Pentium Systems

What's emerging from R&D labs, heading for tomorrow's offices? How much faster will the Pentium systems be? What tricks will be required to get the most out of the new chip? *PC Magazine* examines what's on and what's missing from the first desktop and server systems engineered for Intel's eagerly awaited processor.

Document Management

Keeping track of your company's letters, reports, memos, and other documents usually means frazzled secretaries shuffling through mountains of paper in poorly organized file cabinets. *PC Magazine* tests four document management products designed to track and catalog documents from creation to storage and help find that elusive needle in the paperwork haystack.

Free Utility

What do you do with a file created with a word processor you don't have? PCMCVT, our next issue's utility, lets you convert it into a straight ASCII text file so you can easily read it in five popular word processors: Ami Pro for Windows and both the DOS and Windows versions of Word and WordPerfect. □

Editorial Product Index

Reader Service			
No.	Product	Company	Page
420	ALR Evolution V	Advanced Logic Research	38
421	ALR ProVEISA V	Advanced Logic Research	38
475	Apple Macintosh Quadra 800	Apple Computer	138
410	Ariel 486DX2-66EVS	Ariel Design Inc.	64
404	AST Pen Essentials	AST Research Inc.	59
404	AST PenExec	AST Research Inc.	59
401	Authorware Professional for Windows, Version 2.0	Macromedia Inc.	50
460	BeyondMail for DOS, Release 1.1	Beyond Inc.	270
460	BeyondMail for Windows, Release 1.0	Beyond Inc.	270
456	Body Illustrated	Spirit of Discovery	466
402	Canon NoteJet 486	Canon Computer Systems Inc.	59
459	Chemistry Works	Software Marketing Corp.	468
463	CM/1, Version 1.0	Corporate Memory Systems Inc.	276
409	Command View, Version 2.0	Artist Graphics	64
474	Compaq Deskpro 5/66M Model 510	Compaq Computer Corp.	136
422	Compaq Deskpro/M	Compaq Computer Corp.	39
471	Consensys V 4.2	Consensys Corp.	234
423	DEC 560ST Pentium	Digital Equipment Corp.	40
415	Defect Control System for Windows, Version 2.0	The Software Edge Inc.	66
414	Dell 325SLi	Dell Computer Corp.	59
472	Dell Unix System V Release 4	Dell Computer Corp.	238
413	DisplayMaster	Commix SP Inc.	66
405	FolderBolt for Windows	Kent Marsh Ltd.	60
406	FotoMan Plus Digital Camera	Logitech Inc.	60
469	Futurus Team DOS/Windows Combo	Futurus Corp.	297
476	HP Apollo 9000 Model 715/50	Hewlett-Packard Co.	146
424	HP NetServer LM	Hewlett-Packard Co.	40
427	HP100LX	Hewlett-Packard Co.	48
477	IBM RS/6000 PowerStation 365	IBM Corp.	152
480	Interactive Unix, Version 3.0.1	SunSoft Inc.	240
464	Keyfile 2.0	Keyfile Corp.	285
428	Listen for Windows, Version 1.0	Verbex Voice Systems Inc.	49
465	Lotus Notes, Release 2.1A	Lotus Development Corp.	287
418	Lotus Notes, Release 3.0	Lotus Development Corp.	52
462	Mastering CorelDRAW 3	Sybex Inc.	73
429	Microsoft Mouse, Version 2.0	Microsoft Corp.	44
467	Microsoft Windows for Workgroups 3.1, Version 3.1	Microsoft Corp.	292
473	Microsoft Windows NT, Version 3.1	Microsoft Corp.	173
407	Morph for Windows	Gryphon Software Corp.	60
	NeXTStep for Intel Processors	NeXT Inc.	238
419	Norton PC Anywhere, Version 1.0 for Windows	Symantec Corp.	53
425	The Norton Utilities, Version 7.0	Symantec Corp.	46
466	Office.IQ	Portfolio Technologies Inc.	291
457	Operation: Frog	Hi-Tech Expressions	467
470	OS/2 2.1 beta	IBM Corp.	207
412	Panasonic CF-580, CF-580C	Panasonic Communications and Systems Co.	66
403	Platinum Publisher	Platinum Software Corp.	59
403	Platinum, Version 4.0	Platinum Software Corp.	59
461	Power of CorelDRAW!	MIS Press	73
458	Quarky and Quaysoo's Turbo Science	Sierra On-Line	468
481	SCO Open Desktop, Version 2.0	The Santa Cruz Operation Inc.	250
478	Silicon Graphics Iris Indigo R4000 XZ	Silicon Graphics Inc.	157
	Solaris for x86, Version 2.1	SunSoft Inc.	244
417	Stratavision 3d PC	Strata Inc.	56
479	Sun SPARCstation LX	Sun Microsystems Inc.	160
426	SuperMatch Spectrum/24	SuperMac Technology	44
468	TeamLinks for Windows, Version 1.1	Digital Equipment Corp.	296
411	Transverter Pro for Windows	TechPool Software Inc.	66
482	UnixWare	Univel	253
407	WinImages: morph	Black Belt Systems	60
451	WORX Toolkit	Mystic Software	77
408	Yamaha Hello!Music!	Yamaha Corp. of America	64

TECHNICAL COLUMNS		
User-to-User.....	An improved VCPY.BAT lets you copy volume names among floppy disks.....	300
User-to-User.....	Print out a help reference for all of DOS's commands.....	300
Tutor.....	Deleting and Undeleting Files from Your Disk.....	307
Lab Notes.....	Creating Hidden Credit Screens in Windows Programs.....	313
Utilities.....	Bring Your Desktop to Life with ICON ANIMATOR.....	335
Environments.....	OS/2 Paths and Fonts: The Versatile Connection.....	347
Power Programming.....	Four Techniques to Enhance Your Windows Help Files.....	359
SOLUTIONS		
PCs.....	Memory parity errors that appear when you run Windows.....	364
Peripherals.....	Why some monitors show a faint gray line running across the screen.....	364
Peripherals.....	How to get stuck labels out of your printer.....	364
Peripherals.....	What you should know about horizontal and vertical scan rates when choosing a monitor.....	364
Operating Environments.....	What to do when the phrase "Bad command or file name" appears on your screen.....	369
Operating Environments.....	How to force your Windows swap file to the end of the disk.....	369
Word Processing.....	Another way to load template files in WordPerfect without overwriting the original.....	371
Word Processing.....	A shortcut for adding new rows and columns to WinWord tables.....	371
Spreadsheets.....	An Excel macro for opening and closing files.....	373
Databases.....	Suggestions on setting up your FoxPro environment for debugging.....	374
Graphics.....	Creating masked objects in Adobe Illustrator.....	382
Networking.....	Speeding up large print jobs over a LAN.....	385
Networking.....	How to reduce microwave interference on a 10BaseT network.....	385

TECHNICAL COLUMNS

User-to-User.....	An improved VCOPY.BAT lets you copy volume names among floppy disks.....	300
User-to-User.....	Print out a help reference for all of DOS's commands.....	300
Tutor.....	Deleting and Undeleting Files from Your Disk.....	307
Lab Notes.....	Creating Hidden Credit Screens in Windows Programs.....	313
Utilities.....	Bring Your Desktop to Life with ICON ANIMATOR.....	335
Environments.....	OS/2 Paths and Fonts: The Versatile Connection.....	347
Power Programming.....	Four Techniques to Enhance Your Windows Help Files.....	359

SOLUTIONS

PCs.....	Memory parity errors that appear when you run Windows.....	364
Peripherals.....	Why some monitors show a faint gray line running across the screen.....	364
Peripherals.....	How to get stuck labels out of your printer.....	364
Peripherals.....	What you should know about horizontal and vertical scan rates when choosing a monitor.....	364
Operating Environments...	What to do when the phrase "Bad command or file name" appears on your screen.....	369
Operating Environments...	How to force your Windows swap file to the end of the disk.....	369
Word Processing.....	Another way to load template files in WordPerfect without overwriting the original.....	371
Word Processing.....	A shortcut for adding new rows and columns to WinWord tables.....	371
Spreadsheets.....	An Excel macro for opening and closing files.....	373
Databases.....	Suggestions on setting up your FoxPro environment for debugging.....	374
Graphics.....	Creating masked objects in Adobe Illustrator.....	382
Networking.....	Speeding up large print jobs over a LAN.....	385
Networking.....	How to reduce microwave interference on a 10BaseT network.....	385
Languages.....	Three BASIC routines that let you find files and read or modify their attributes.....	385

After Hours

SCIENCE: Body Illustrated, Operation: Frog, Quarky & Quaysoo's Turbo Science, Chemistry Works

SCIENCE SOFTWARE

From Anatomy to Zoology: Scientific Method Meets the PC

BY PETER SCISCO

When students need help with their science homework, it is little wonder that adults send them straight to the library. Now you can send them to the PC instead: Science education programs cover everything from chemistry and physics to the beating of the human or amphibian heart.

The four programs in this roundup, *Body Illustrated*; *Operation: Frog*; *Quarky & Quaysoo's Turbo Science*; and *Chemistry Works* offer a variety of perspectives on science. *Body Illustrated* takes the user on a colorful journey into the human anatomy, while *Chemistry Works* provides a rather dry but thorough textbook account of the periodic table of elements. *Operation: Frog* takes the mess out of the dissection ritual, and *Quarky & Quaysoo's Turbo Science* takes an MTV-like approach to the basics of science, making it fun for elementary and junior high school children.

The root of all science is observation and experimentation. And, not to make light of the sorry state of scientific knowledge among the general population, there's a fair amount of fun involved in science exploration as well.

That's where science soft-

ware can excel. The best of these programs entertain children and young adults not only with animation, color, and sound, but with the knowledge of science itself.

SPIRIT OF DISCOVERY

Body Illustrated

With *Body Illustrated*, from Spirit of Discovery, anatomy students can tour the human body, from the abducens nerve, which controls the sideways rotation of the eyeball, to the zygomatics—or cheekbones. Clear, 256-color illustrations—many providing front, back, left, right, top, and bottom views—combined with short but excellently written explanatory notes, help create a good learning atmosphere.

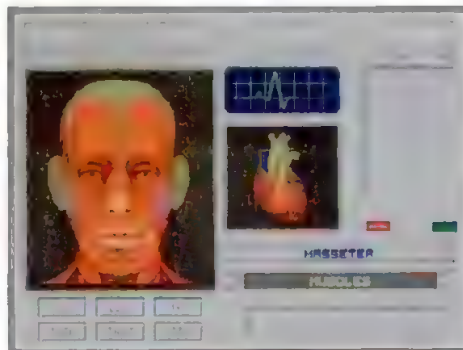
EXPLORING THE BODY

Body Illustrated contains five operational modes: an exploration section, a full set of anatomy lessons, an encyclopedia, a game, and a tutorial mode that serves as a guided tour of the other four options. The modes contain essentially the same information, but each provides a different way of learning.

The exploration section is the least restrictive, allowing students to examine at leisure

any part of the human anatomy. You can choose one of 13 anatomical subdivisions, such as the skeletal, digestive, reproductive, or cardiovascular systems. Each subdivision begins with a general overview and a display that locates the system in relation to the entire human body.

The fantastic voyage within this mode begins when you start to click directly on the anatomical illustrations that accompany the program's written descriptions. Interactive graphics respond to mouse clicks and pointer movements, delving deeper and deeper into the human anatomy. Moving the pointer



Anatomical exploration: *Body Illustrated* shows the major muscles, bones, and organs of the human body.

over the respiratory system, for example, causes the upper respiratory system to appear in red and lower respiratory system in blue. You can explore the lungs, trachea, bronchi, and larynx by clicking on the blue region, or by selecting one of the corresponding choices on a menu to the right of the diagram.

Body Illustrated's Lesson mode is quite comprehensive, and is equal in scope to a good

biology class. Anyone who completes all 13 of these lessons will have a solid understanding of the human anatomy. The lessons provide detailed and methodical explanations of the parts of each of the 13 systems, and describe how those parts work together to achieve their anatomical purpose.

A lesson about the digestive system, for example, starts with an overview, then begins a journey through the alimentary canal at the mouth. From here, the student moves to the pharynx, then down the esophagus to the stomach. The lesson continues by moving through the pyloric orifice, into the small intestine, into the large intestine, and, finally, to the colon and rectum, providing information along every step of the way. Accessory organs that are not part of the system, but work with the system (such as the salivary glands, in this example), are also discussed.

For 9 of the 13 systems, a 10-question quiz follows the lessons. This quiz tests the student's ability to identify parts of the system just learned. Unfortunately, there is no way to save a test score to compare with previous quizzes, or to track the student's process.

STANDARD MEDICAL TERMS

Body Illustrated does not shrink from the complexities of human anatomy. The program uses standard medical and anatomical references

Body Illustrated

and terms, which will be unfamiliar to most users. Unfortunately, however, there is no convenient way to look up many of those terms. A word search, which is accessed by clicking on the help button, aids users in finding the illustrated body parts, but hypertext and a more comprehensive dictionary would be useful.

To its credit, Body Illustrated does provide a digitized speech pronunciation guide, since many anatomical terms are difficult for students to pronounce correctly (*olfactory epithelium*, for example). Though the program recognizes Sound Blaster and compatible cards, the computer's internal speaker provides fairly clear audio. One glaring oversight of this feature is the lack of pronunciation cues in the text itself, even in the encyclopedia.

Even without those cues, the encyclopedia makes a fine on-line reference. More than 350 anatomical terms are listed, with brief descriptions and illustrations. This is perhaps the most utilitarian part of the program.

Once a student has attained proficiency, a game module similar in design to the lessons' quiz sections lets up to 10 players compete in a race to find a series of body parts. The fewer times a player clicks on the display, the higher the point score. All players compete against a 30-second clock; the three skill levels (easy, medium, and hard) can be set individually, to handicap better players.

Throughout, Body Illustrated very effectively shares the core of its information among its different modules. Even though the text and pic-

tures remain the same, the different perspectives provided by each module create a broader approach to the information than might be gained from a traditional illustrated text. This program is an excellent example of how interactive programs can succeed as teaching tools.

Body Illustrated, \$79.95.

Requires: 640K RAM, DOS 3.0 or later, 3MB hard disk space. *Spirit of Discovery*, 5421 Avenida Encinas, Carlsbad, CA 92008; 800-722-8988, 619-929-2010; fax, 619-929-2035.

Circle 456 on reader service card

HI-TECH EXPRESSIONS

Operation: Frog

Not too many months ago, the *New York Times Magazine* reported that countless numbers of frogs have vanished from their habitats around the world; scientists continue to disagree on the reasons behind the absconding amphibians. Meanwhile, introductory biology students—without frogs to dissect—could very well feel the effects of this mystery.

Operation: Frog, an inexpensive DOS-based program from Hi-Tech Expressions, may provide some relief. This \$24.95 program replaces our real pond-dwelling brethren with computer models suitable for home or classroom use. The dissection simulation has two objectives: to open a frog and remove its organs in the correct order, and to examine the extracted parts to see how they function and work together. Using a standard set of dissection tools (scissors, probe, magnifying glass, and for-

ceps), students can study a frog's anatomy without wax-lined biology trays or dangerous scalpels. The dissection simulation serves as a good primer on anatomy; for extra reinforcement, students can even reconstruct the little guy. Try *that* with a real frog.

At the start of the program, the frog lies belly-up at the left of the screen. The toolbox and dissection tray are at the right. In order to dissect properly, the student must locate the correct incision and snip points by using the probe (activating the probe tool as it is passed over the frog highlights the correct spots). Once the points are found, the student uses the scissors to make the proper incisions. After a few correct cuts, the frog's interior is displayed.

The first organs to be removed are the heart, the bladder, and the liver. To proceed, the student again activates the probe over the frog; doing so identifies the organ and indicates the proper clip point for removal. The frog's interior is laid out much like a transparency in a biology reference

and move it to the dissection tray. The tray contains the outlines of the various organs so that the student can keep track of what has been removed and what remains.

Once the student places an organ in the dissection tray, it can be examined more closely with the magnifying glass. Using this tool, the student can bring up a color display of the organ that labels the various elements, describes the organ's purpose, and explains how it works. At this point, the student may compare the organ with its human counterpart, which is the reason for all of this dissection in the first place. The organ display screens also allow entrance to the game's index, an alphabetical listing of anatomical parts. The student can use the index as a study guide.

NO DISTRACTIONS

Operation: Frog doesn't try to do too much, and sticks to its classroom roots with a simple interface, effective use of color, and brief animated sequences that teach. There are no distracting sound effects or theme music. The program should be welcomed by parents looking for an introductory anatomy package for their children.

Of course, Operation: Frog doesn't pretend to duplicate the experience of dissecting a real frog. A real dissection involves a different kind of skill, as well as attention to such details as removing the animal's skin after the initial incision has been made. Operation: Frog is also missing certain bones and muscles: The important systems are labeled, but those systems' individual parts are not there.



Dissection without the mess: Operation: Frog teaches basic biology principles.

book, with different layers visible at different points in the dissection procedure.

Once students locate the clip point, they can use the scissors to snip the organ free and the forceps to pick it up

Operation: Frog

During a real dissection in a classroom environment, a student may be required to locate a specific organ and remove it. To follow such instructions successfully, a student must already possess some basic knowledge of the frog's anatomy. With *Operation: Frog*, that knowledge isn't necessary; as long as a clip point can be found, the student can snip the organ free—even if that student can't identify the organ.

Despite these obvious shortcomings, the program can supplement an actual dissection and can provide a good anatomy lesson in the process. Now, if it could only solve the mystery of the vanishing frogs.

Operation: Frog, \$24.95. Requires: 256K of RAM, DOS 2.1 or later. Hi-Tech Expressions, 584 Broadway, New York, NY 10012; 212-941-1224; fax, 212-941-1521.

Circle 457 on reader service card

SIERRA ON-LINE

Quarky and Quaysoo's Turbo Science

Quarky and Quaysoo's *Turbo Science* capitalizes on fun in a frenetic, science-based race game for kids 9 to 14 years old. The form of the game is a race between two teams—one of computer opponents, the other one of the title characters and the user.

Teams compete by answering general and specific questions about the physical sciences. Correct answers earn money, which can be used to buy transportation to the racetrack's next checkpoint. Reach the checkered flag first and you win the race; rack up several wins and you move up in rank and compete against

more challenging adversaries.

The user can adjust the game's difficulty, by choosing hard or easy questions. The easy questions deal mostly with quantities or properties that can be measured, or they can be answered by examining the pictures on the screen. At the harder level, more of the questions require some deductive reasoning.

Marketed as part of Sierra On-Line's *Sierra Discovery Series*, the \$49.95 *Turbo Science* is more than a game. The



Correct answers to *Turbo Science's* questions propel Quarky and Quaysoo toward the finish line.

program employs observation, experimentation, and hypothesis within a radical, colorful framework that should interest almost any kid. After all, science is more than lab charts and beakers. The game has all the tools kids need to pursue the scientific method, including a toolkit with such devices as a scale, measuring tape, and voltage, light, and sound meters. *Turbo Science* actually encourages use of the toolkit, by stopping the clock while kids measure and weigh objects to test their theories.

Likewise, there's no penalty for using the *Research Guide*, a 152-page book that, once opened, is hard to put down. The guide is designed and written to appeal to kids whose idea of literature is the song list from the back of a Guns 'n Roses CD, but the in-

formation is straightforward, accurate, and amazingly thorough. These folks should write some textbooks. In fact, this guide should be a textbook.

FRANTIC PACE

Conservative parents may be uncomfortable with *Turbo Science's* frantic pace, blaring rock track, and slang-heavy text. The program may not be suitable for kids who are easily distracted or who must cope with an attention-deficit disorder. Likewise, it's assumed

that kids can tell when a passage in the *Research Guide* is written in a character's voice rather than as a model of perfect grammar. Hector Skullface (a dead ringer for Frankenstein), for example, speaks monstrous English, broken by ex-

pressions like "BIG FUN!!" At the same time, he does a fine job of teaching the principles of electromagnetism and static electricity.

The program's most serious omission comes in the *Research Guide's* section on famous scientists, which lists no women. Although female characters are well-represented throughout the guide, Marie Curie (Nobel Prize in chemistry, 1911), Sally Ride, and others miss a chance to inspire young women to careers in science. Also lacking is a two-player mode that would let teams of kids compete against one another.

Any real scientist knows that science is a game, but it took a software company to turbo-charge the scientific method. Ms. Wizard might be annoyed that she's not in the

game's Hall of Fame, but Mr. Wizard will never be the same.

Quarky and Quaysoo's Turbo Science, \$49.95. Requires: 640K RAM, DOS 3.0 or later, 8MB hard disk space. For Ages 9 to 14. Sierra On-Line, P.O. Box 485 Coarsegold, CA 93614; 800-326-6654.

Circle 458 on reader service card

SOFTWARE MARKETING CORP.

Chemistry Works

The title is reminiscent of a DuPont advertisement, but *Chemistry Works* from Software Marketing Corp. is a serious science reference tool for budding chemists and professionals. Based on the periodic table of 108 natural and synthetic elements, *Chemistry Works* becomes an interactive text for reference and study.

An understanding of chemistry is essential for students interested in pursuing careers in areas ranging from horticulture to pharmacy. But the language of atoms and molecules can deter even the most ambitious student. By providing several different ways to get to the necessary information, *Chemistry Works* can help students see the relationships between elemental properties and periodic table placement.

Any query starts at the main screen, a display of the periodic table. From here, the user may select any of the elements to see a detailed report, which includes the element's atomic weight, the chemical group to which the element belongs, and the physical state in which it naturally exists. While most of this information should be part of any decent textbook, *Chemistry Works* improves on many standard texts with its details: There are 22 distinct properties that are quantified. Furthermore, the

Chemistry Works

program offers extra information in the form of spectral analysis, electron configuration, crystal structure, and a list of isotopes. And as with all good computerized reference material, Chemistry Works also lets users search for specific items in ways no textbook can match.

All of this information is essential to mastering chemistry, but the program misses several opportunities to do even more. Documentation is sparse, and although an on-line glossary alleviates some of the problems, there is no general index. For example, a student who is curious about the electronegativity of neon (a noble, or inert, gas) will notice that this property is

marked with an asterisk. But clicking on electronegativity only brings up a glossary entry: Electronegativity is the element's ability to attract outside electrons to become negatively

with any hypertext, so terms cannot be cross-referenced from one entry to another.

Chemistry Works fares much better with its database query features. Selecting search criteria is a pretty straightforward process and writing the queries themselves is simplified with a push-button interface.

Typed queries are also allowed. The syntax guidelines should pose very few problems, especially after a few initial searches have been completed.

COMPARING PROPERTIES

Related to the database query feature is a graphing function, which students can use to compare properties of the elements they've selected. Only line and bar graphs can be

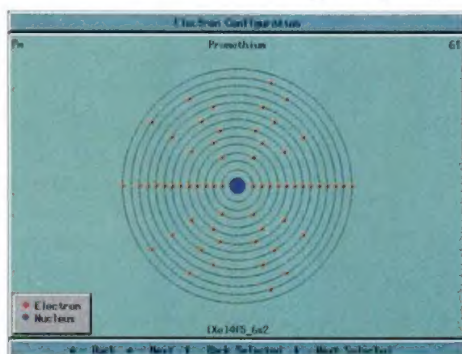
created, and there's no way to print the graphs or export them to a file. Reports, which are created in a way similar to making database queries (and which list data in a columnar format) can be printed or saved to an ASCII file.

Chemistry Works forgoes frills in favor of detailed information. As a tool for professionals, it can certainly replace reference works with its quick access to data. But the lack of a general index limits its use to students in more advanced stages of study. □

Chemistry Works, \$69.95.

Requires: 640K of RAM, DOS 3.3 or later, 1.5MB hard disk space. Software Marketing Corp., 9830 South 51st St., Bldg. A-131, Phoenix, AZ 85044; 602-893-2400; fax, 602-893-2042.

Circle 459 on reader service card



Available: A display of Promethium's shell configuration shows which electrons may attract other elements.

charged. There is simply no explanation for the asterisk. Therefore, the user would have to realize that, by definition, inert gases have no electronegativity. The glossary is not linked

MOVING?

Please write to: PC Magazine, P.O. Box 54093, Boulder, CO 80322. Include your mailing label from a recent issue of PC Magazine for faster service. Please allow up to 60 days for change of address to take place.

Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Robin Raskin

20MB to Potty-Train; At What Cost College?

I love my kids, but a megabyte is a megabyte. The Berenstain Bears: Learning at Home requires 20MB. (Compton's NewMedia Inc., 619-929-2500.)



Next in the Sierra Lineup: Yasir Arafat's Middle East?

(This is a real press release—really!)

“Entertainment software developer and publisher Sierra On-Line announced today the signing of a publishing agreement with Daryl Gates, former Chief of the Los Angeles Police Department.

"Gates' design for the next installment of the *Police Quest* series puts game players in the role of a present-day LAPD detective tracking down the source of seemingly random murders. By-the-book procedures and real world pressures from the media and public play a dominant part in the game. The game will also feature photo-realistic backgrounds and video-captured actors. . . .

“Chief Gates said, ‘I want to give computer users the opportunity to see what it’s like to be a cop in L.A. I want to show the day to day pressures officers face and provide an accurate picture of the dangers and difficulties they encounter in trying to solve a crime.’”

BUZZWORD WATCH

Osbourning Announcing the next product before you are ready to ship it in order to sell the obsolete current product.

First heard: Paul Otellini, Intel's general manager, in a conversation regarding Intel's decision a few months back to postpone the availability of the P5.

SMILEYS



I Second That Emoticon

Emoticons, or smileys, are used in e-mail and other communications. *Smileys*, a book of over 650 of these sideways outpourings com-

piled by David Sanderson, provides the ultimate guide. Take the Smilev test:

1. *<:-)	a. confused
2. =^)	b. frog
3. [:-)	c. wizard
4. 8=:-)	d. Santa Claus
5. 8)	e. Ronald Reagan
6. %\v	f. Mouseketeer
7. -=#;-)	g. Dagwood Bumstead
8. 8(:-)	h. ha ha!
9. %-(	i. partied all night
10. :-)	j. chef
11. #-)	k. listening to walkman
12. 7:^\]	l. Picasso

Answers:

1=d, 2=g, 3=k, 4=j, 5=b, 6=l, 7=c, 8=f, 9=a, 10=h, 11=i, 12=e.

Spontaneous Evolution

"According to Sternberg, the discovery of the LAN Safety came by accident when two computer programs were left running . . . and accidentally merged."

—THE FARMINGTON VALLEY HERALD
(CONNECTICUT), JANUARY 28, 1993



Improv

Lotus' New approach to spreadsheets

- No cryptic cell addresses
- easy to sue and understand

\$129

 **More from Your
Favorite Litigators**



\$999. NO, IT'S NOT A TYPO. (SORRY COMPAQ.)

SAVE \$200

DELL PERFORMANCE SERIES 333x/L
BUSINESS LEASE: \$37/MO.

Contrary to many systems you see advertised for under \$1,000, ours comes complete with a VGA color monitor (14" 640 x 480, 31mm). Plus an 80MB hard drive. Plus 2MB RAM. Plus one diskette drive. Plus MS-DOS, Microsoft® Windows 3.1, and a mouse. Plus 3 ISA expansion slots. Plus 256KB video RAM. Quite a few pluses, wouldn't you say?

CALL AND ORDER TODAY. OFFER EXPIRES 6/30/93.

There's no mistake about it. For a limited time only, you can get the fastest Dell 386SX made for under \$1,000. (That means you'll save up to



\$200.) And it comes complete with a VGA color monitor.

What's more, you also get guaranteed on-site service,* and technical support 24 hours a day, 7 days a week—with guaranteed telephone response in under five minutes*. All of which shouldn't surprise you since we were the winner of the latest Dataquest® Customer Satisfaction Survey, helping us to become the world's third largest industry-standard PC company.

Speaking of fast, take advantage

of our quick shipment program. That way you can receive your new system within three days of ordering it.

So call and order today. Offer expires 6/30/93. Which is one thing in this ad Compaq will be happy to hear.

DELL™

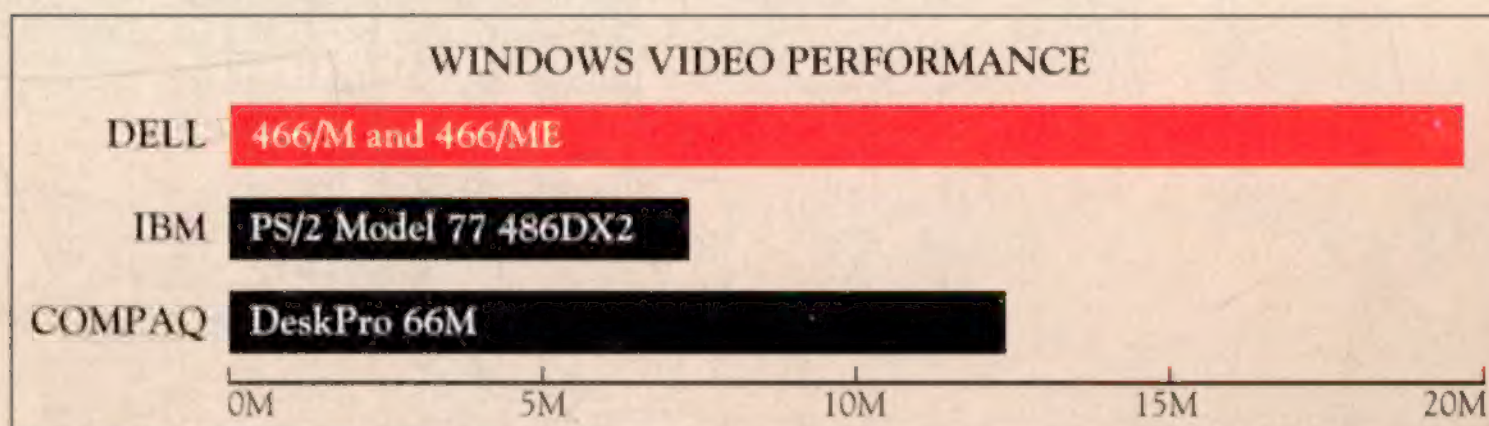
800-247-5519

WHEN CALLING, PLEASE REFERENCE #118FC

HOURS: 7AM-9PM CT MON-FRI,

8AM-4PM CT SAT, 10AM-3PM CT SUN.

COMPAQ'S AND IBM'S VIDEO IS BEHIND THE TIMES.



Performance measured by running WINBENCH version 3.1 at 640 x 480, 256 colors. Results measured in millions of WINMARKS. Results for IBM and Compaq as published by PC Magazine in issue dated January 26, 1993. Results for Dell 466/M and 466/ME provided by Dell Performance Measurement Lab, January 1993. DeskPro 66M configured with 8MB RAM, 210MB IDE HD, QVision 1024/E controller with 1MB VRAM. PS/2 model 77 486DX2 configured with 8MB RAM, 400MB SCSI HD, XGA-2 with 1MB VRAM and 256KB cache. 466/M and 466/ME both configured with 8MB RAM, 170MB IDE HD, local bus video with 1MB VRAM, and 128KB cache.

Our Dell 466/M and 466/ME with over 19 million WINMARKS, outran the Compaq DeskPro 66M with QVision and IBM PS/2 Model 77 486 DX2 with XGA-2. That means we're up to 57% faster than QVision and up to 174%



faster than XGA-2. Thanks, of course, to our accelerated local bus video and fast drivers for Windows applications. Both help put the Dell® 466/M a little ahead of its time.



THE DELL 466/M i486™ DX2 66MHz SYSTEM

\$3,149

BUSINESS LEASE®: \$117/MO.

- 8MB RAM • 230MB (17ms) HARD DRIVE • 128KB EXTERNAL CACHE
- FLASH ROM EMBEDDED DIAGNOSTICS • 6 ISA EXPANSION SLOTS
- UPGRADEABLE TO PENTIUM™ TECHNOLOGY • ACCELERATED LOCAL BUS VIDEO WITH 1MB VIDEO RAM • ULTRASCAN™ 14C MONITOR (14" 1024 x 768, .28mm, NI)
- ONE DISKETTE DRIVE (3.5" OR 5.25") • MS-DOS® 6.0

OR CHOOSE THE 466/ME EISA SYSTEM FOR ONLY \$200 MORE

DELL™

800-247-5509

WHEN CALLING, PLEASE REFERENCE #118FB.

HOURS: 7AM-9PM CT MON-FRI, 8AM-4PM CT SAT, 10AM-3PM CT SUN.

IN CANADA: CALL 800-668-3021. IN MEXICO CITY: 228-7811.